SPECIAL { INGREDIENTS AND COST OF A CUBIC YARD OF CEMENT MORTAR—BY L. C. SABIN, U. S. ASST. ENGINEER

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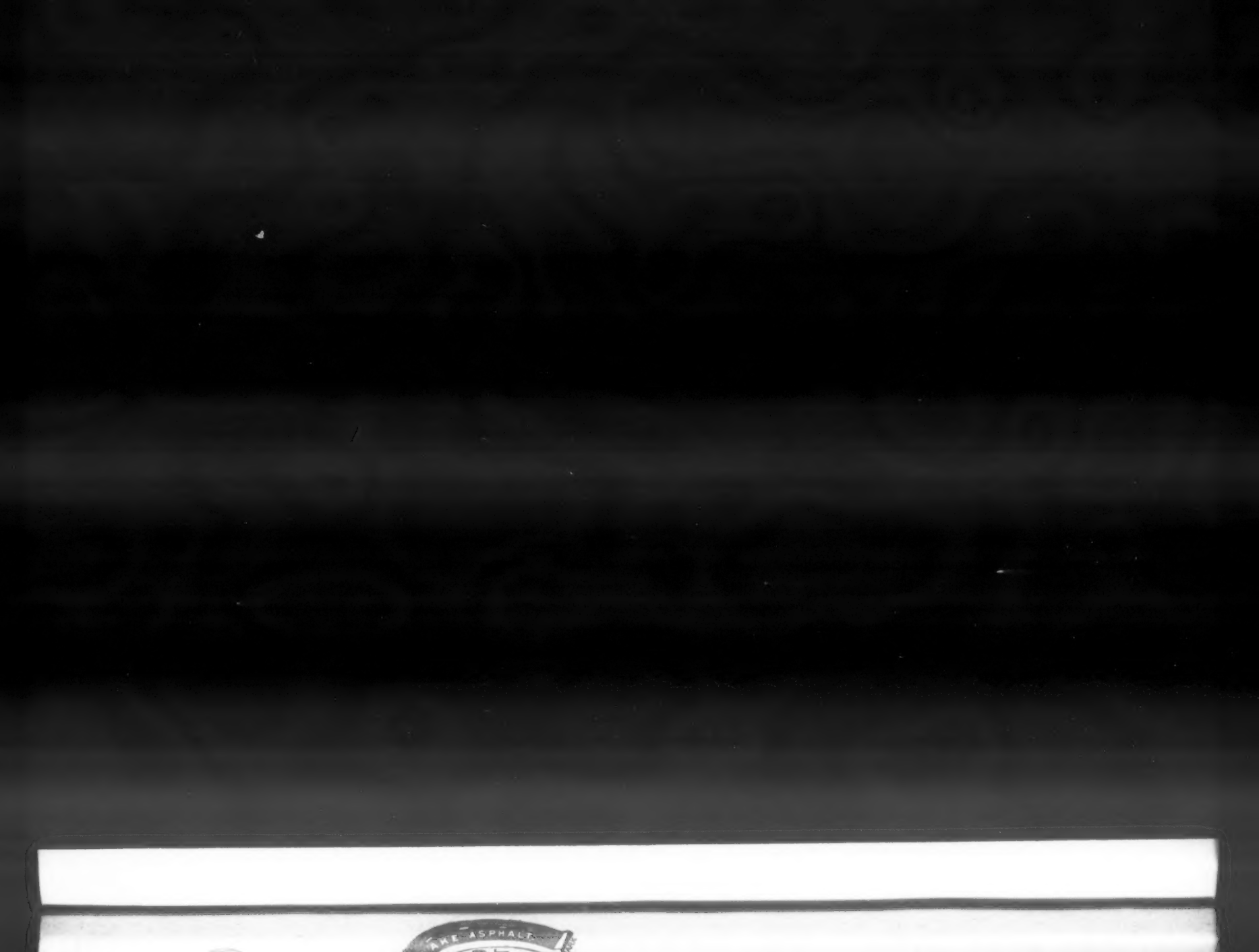
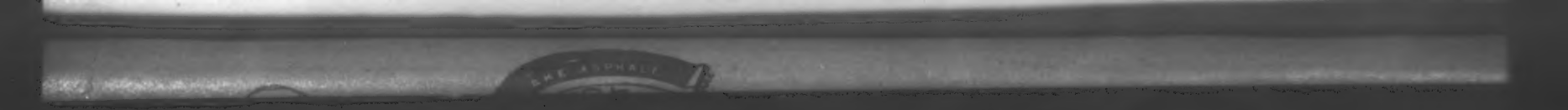




Municipal Engineering

VOLUME XVI. FEBRUARY, EIGHTEEN NINETY-NINE. NUMBER 2.

INGREDIENTS OF A CUBIC YARD OF CEMENT MORTAR AND THE COST.

By L. C. Sabin, C. E., U. S. Asst. Engineer.

1. The character of the ingredients used in making cement mortar varies so much that it is difficult to accurately determine the cost of a proposed mortar except by experimenting with the materials that are to be employed. The weights per cubic foot of both cement and sand vary greatly according to the conditions of packing, the moisture, etc. The percentage of voids in the sand is one of the most important variations affecting the amount of mortar made with certain materials mixed in given proportions. The consistency of the mortar also has a marked effect, and different cements show a considerable variation in the volume of mortar that a given weight will yield. In any general treatment of the question, then, we may expect only approximate results, and the discussion here given must be considered in this light.

2. The experiments, from which tables 1 and 2 were derived,* were made with a natural sand weighing 100 pounds to the cubic foot, dry, and having about three-eighths of the bulk voids. The grains varied in size from 0.01 inch to 0.1 inch in diameter, with a few grains outside of these limits. The consistency of the mortar was such that when struck with the shovel blade the moisture would glisten on the smooth surface thus formed. In the experiments the proportions were determined by weight and the results for proportions by volume were deduced from them. The results for neat, natural cement mortar and for the natural cement mortars containing more than four parts sand by weight were derived by analogy.

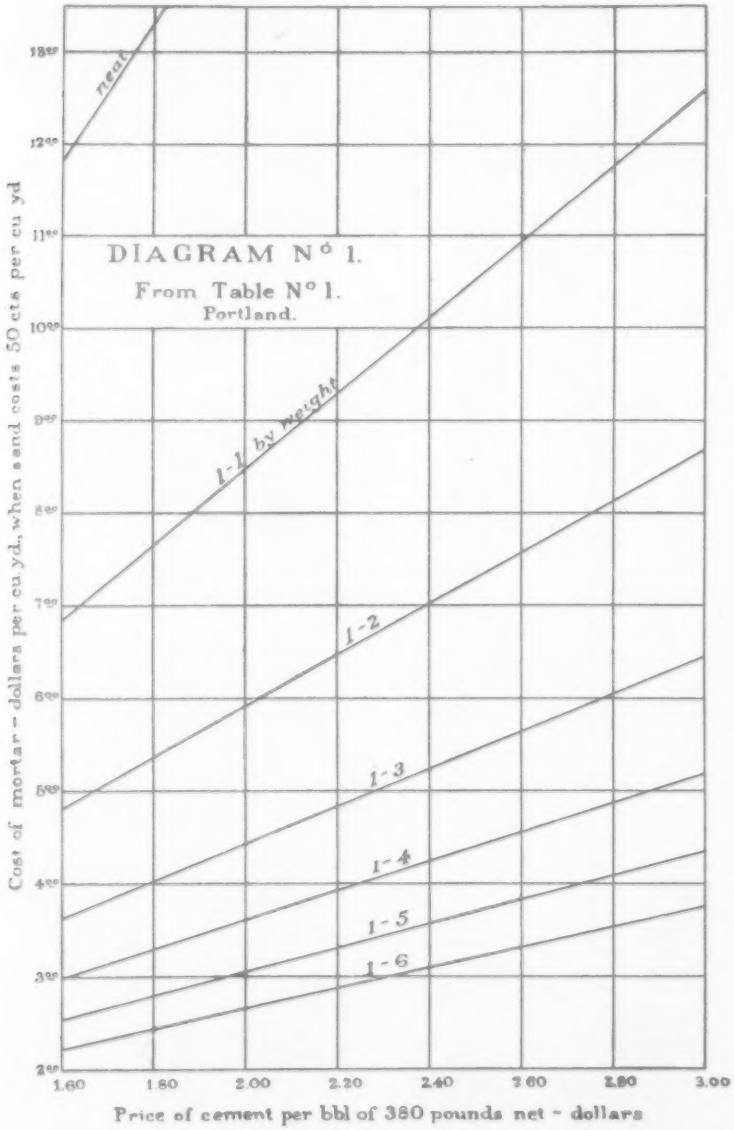
EXPLANATION OF TABLES.

3. The first section of table 1 gives the amount of materials required for Portland cement mortar when the proportions are stated by weight; the second and third sections refer to proportions by volume of loose sand to packed cement when the size of the cement barrel is assumed at 3.65 cubic feet and 3.33 cubic feet respectively. The fourth section gives the materials required when the proportions are given in terms of volume of loose sand to loose cement. Likewise, the first section of table 2 for natural cement refers to proportions by weight; the second, third and fourth sections, to proportions by volume of loose sand to packed cement when the cement weighs 265 pounds, 280 pounds and 300 pounds net per barrel respectively; while the fifth section refers to proportions of loose sand to loose cement.

The method of stating proportions

*Annual Report Chief of Engineers, U. S. A., 1894, page 2312.

by weight is the most accurate, but when the sand does not approximate the weight of 100 pounds per cubic foot when shoveled dry into a measure, the sections of the tables referring to weight proportions may require a correction, and it may be simpler to use the sections giving proportions by volume of loose sand to packed cement. The method of stating proportions by volume of loose sand to loose cement is to be deprecated, but since it is occasionally used provision is made for it in the tables.



In using those portions of the tables where the proportions are stated by volume it should be borne in mind that if the sand is damp when used it will weigh less per

cubic foot; hence more, by measure, will be required to make a cubic yard of mortar.

COST OF MORTAR.

4. With the data given in tables 1 and 2 and a knowledge of unit prices of the materials used in the mortar, one may estimate the cost of the materials in a given quantity of mortar. The cost of mixing will, of course, depend upon the cost of labor, the method employed, etc., and may vary from fifty cents to a dollar and fifty cents per cubic yard. If we assume for illustration that natural cement can be delivered on the mixing platform for $1.10 per barrel of 280 pounds net, that sand costs 60 cents per cubic yard and the mixing costs $1.00 per yard of mortar, then we have for

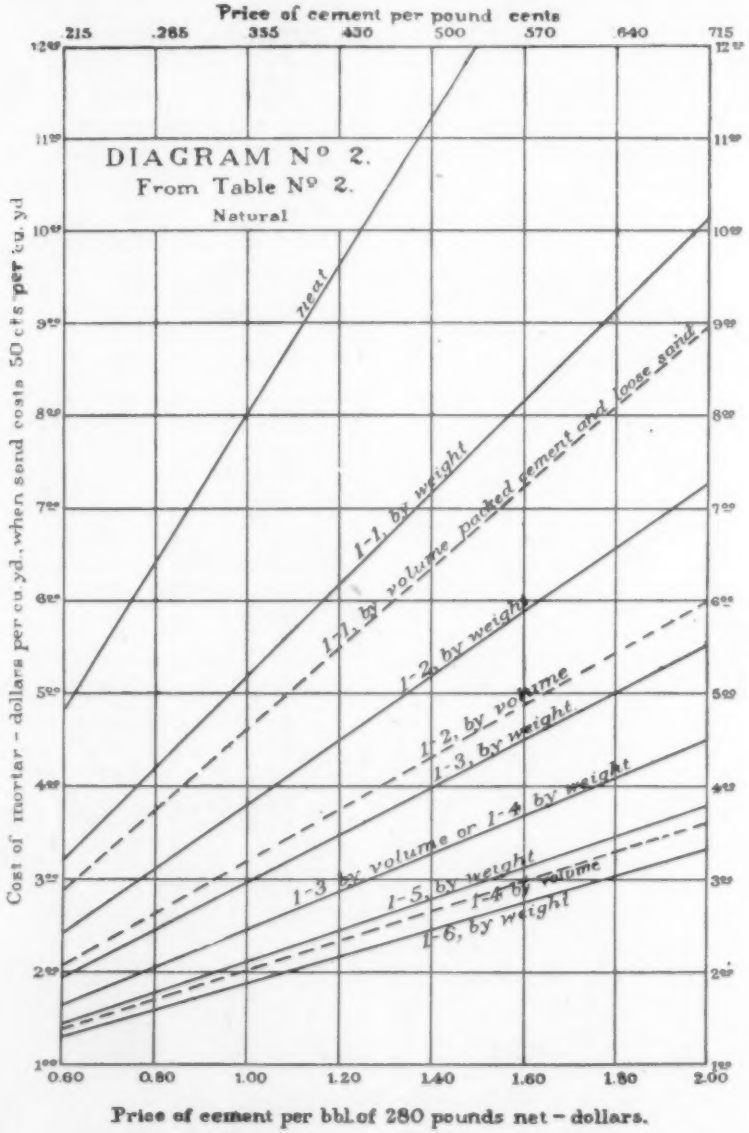


TABLE 1—INGREDIENTS REQUIRED FOR ONE CUBIC YARD OF MORTAR—PORTLAND CEMENT.

[Sand weighs about 100 pounds per cubic foot. Voids 3/8 of volume.]

Parts sand to 1 of cement.	Proportions by weight, dry sand and cement.			Proportions by volume, dry loose sand to packed cement; packed cement assumed at 104 pounds per cu. ft. or 380 pounds per bbl. of 3.65 cu. ft.			Proportions by volume, dry loose sand to packed cement; cement assumed at 114 pounds per cu. ft. or 380 pounds per bbl. of 3.33 cu. ft.			Proportions by volume, dry loose sand to loose cement; loose cement assumed at 85 pounds per cu. ft.		
	Cement.		Sand, cu. yard.	Cement.		Sand, cu. yard.	Cement.		Sand, cu. yard.	Cement.		Sand, cu. yard.
	Pounds.	Bbls. of 380 pounds net.		Pounds.	Bbls. of 380 pounds net.		Pounds.	Bbls. of 380 pounds net.		Pounds.	Bbls. of 380 pounds net.	
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*
0	2,810	7.40	0.00	2,810	7.40	0.00	2,810	7.40	0.00	2,810	7.40	0.00
1	1,555	4.08	0.57	1,585	4.17	0.56	1,640	4.32	0.54	1,440	3.79	0.64
2	1,050	2.76	0.78	1,080	2.84	0.77	1,140	3.00	0.74	930	2.45	0.81
3	760	2.00	0.84	785	2.06	0.84	850	2.24	0.82	660	1.74	0.87
4	600	1.58	0.88	615	1.62	0.88	665	1.75	0.87	515	1.36	0.90
5	490	1.29	0.91	505	1.33	0.90	550	1.45	0.89	425	1.12	0.92
6	420	1.10	0.93	435	1.14	.....	470	1.24	0.91	.....	.....	.....
7	.....	.....	.....	.....	.....	.....	410	1.08	0.93	.....	.....	.....

TABLE 2—INGREDIENTS REQUIRED FOR ONE CUBIC YARD OF MORTAR—NATURAL CEMENT.

[Sand weighs about 100 lbs. per cu. ft. Voids 3/8 of volume.]

Parts sand to 1 of Cement	Proportions by weight, dry sand and cement.					Proportions by volume, dry loose sand to packed cement; cement assumed at 71 lbs. per cu. ft. or 265 lbs. net per bbl.			Proportions by volume, dry loose sand to packed cement; packed cement assumed at 75 lbs. per cu. ft. or 280 lbs. net per bbl.			Proportions by volume, dry loose sand to packed cement; cement assumed 80 lbs. per cu. ft. or 300 lbs. net per bbl.			Proportions by volume, dry loose sand to loose cement; loose cement assumed at 60 lbs. per cu. ft.				
	Cement.				Sand cubic yard.	Cement.		Sand cubic yard.	Cement.		Sand cubic yard.	Cement.		Sand cubic yard.	Cement.				Sand cubic yard.
	Pounds.	Bbls. of 265 lbs. net.	Bbls. of 280 lbs. net.	Bbls of 300 lbs. net.		Pounds.	Bbls. of 265 lbs. net.		Pounds.	Bbls. of 280 lbs. net.		Pounds.	Bbls. of 300 lbs. net.		Pounds.	Bbls. of 265 lbs. net.	Bbls. of 280 lbs. net.	Bbls. of 300 lbs. net.	
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*	*o*	*p*	*q*	*r*	*s*	*t*
0	2,240	8.45	8.00	7.47	0.00	2,240	8.45	0.00	2,240	8.00	0.00	2,240	7.47	0.00	2,240	8.45	8.00	7.47	0.00
1	1,380	5.21	4.93	4.60	0.51	1,180	4.45	0.61	1,210	4.32	0.60	1,250	4.17	0.58	1,080	4.08	3.86	3.60	0.67
2	970	3.66	3.46	3.23	0.72	750	2.83	0.78	780	2.79	0.77	825	2.75	0.76	660	2.49	2.36	2.20	0.81
3	720	2.72	2.57	2.40	0.80	540	2.04	0.85	570	2.03	0.84	600	2.00	0.83	470	1.77	1.68	1.57	0.87
4	570	2.15	2.03	1.90	0.84	425	1.60	0.89	450	1.60	0.88	470	1.57	0.87	.....	.....	.....	.....	.....
5	470	1.77	1.68	1.57	0.87	.....	.....	.....	.....	.....	.....	390	1.30	0.90	.....	.....	.....	.....	.....
6	400	1.51	1.43	1.33	0.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

the cost of a mortar composed of one part cement to two parts sand by weight:

3.46 bbls. cement at $1.10	$3 80
.72 cu. yd. dry sand at .60	43
Cost of mixing per cu. yd	1 00
Total cost of one cu. yd. of mortar	$5 23

5. For approximate results diagrams 1 and 2 give the cost of the materials used in a cubic yard of mortar for different prices of cement. In diagram 1 the proportions by weight only are indicated, since, for Portland, the proportions by volume of loose sand to packed cement vary so little from proportions by weight. In diagram 2 the proportions of natural cement mortars are given by volume of packed cement (280 pounds net per barrel) and loose sand, as well as by weight. The diagrams are made upon the assumptions that the sand is similar to that used in the experiments recorded in tables 1 and 2, and that the cost of sand is fifty cents per cubic yard.

EXAMPLE.

6. To indicate the use of these diagrams let us determine the cost per cubic yard of mortar containing two parts sand to one of natural cement by weight when cement costs $1.30 per barrel of 300 pounds net, and sand is thirty cents per cubic yard. One dollar and thirty cents per barrel of 300 pounds net is equivalent to 0.43 cent per pound and entering diagram 2 with this quantity, we follow the corresponding abscissa till we reach the line marked 1 to 2 by weight; we find this to be on the ordinate four dollars and fifty cents per cubic yard. But in the diagram the sand is assumed to cost fifty cents per cubic yard instead of thirty cents as in the example, and as .72 cubic yard sand is used (see table), we must subtract .72 of twenty cents, or fourteen cents, from this result, making the materials for the mortar cost $4.36 per cubic yard of mortar. If the proportions were by volume of packed cement and loose sand the cost of the materials per cubic yard of mortar would be $3.75 less twenty times .78, or $3.59.

It is understood that the cost of the materials alone is given by the diagrams, the cost of mixing the materials must be added, to obtain the total cost.

THE NECESSITY OF EFFECTIVE MEANS OF SEWAGE DISPOSAL.

By Elmer L. Andrews, Assistant City Engineer, Lima, O.

A wise Providence, in creating this earth and placing upon it the many different species of animal and vegetable life, not only provided the necessary sustenance for the support and highest development of each and every kind, but has very wisely planned for the final disposal of all wastes, fecal matters, etc., incident to such life in all its forms and stages.

The waters of our lakes and rivers, the rocks and soil of the earth, and the air, are filled with nature's agencies for disposing of all animal and vegetable organic wastes or refuse, in such a manner that it not only becomes harmless and no longer obnoxious to the senses, but is converted into substances that may again be assimilated by animal or vegetable life. All such wastes,

if not properly disposed of, are sure to become, sooner or later, in a measure injurious to health.

The natural fate of organic matters is to undergo putrefaction furnishing food for numerous varieties of micro-organisms or bacteria, and this decomposition, many of the products of which are powerful poisons, emits gases which, though they may not themselves contain specific germs of disease, when breathed into the lungs so lower the vitality that the body becomes much more susceptible to zymotic or contagious diseases.

Yet this putrefactive change can be controlled, and when allowed to take place in such a manner that the oxygen of the air shall have free access to the particles undergoing decomposition, may be made the means of entirely removing the noxious character of sewage before discharging it into its final drain.

Excrement, both human and animal, contains as a rule many, and under certain conditions, innumerable varieties of microscopic life, and when improperly or ineffectively disposed of, as is the rule rather than the exception, ultimately finds its way laden with its death-dealing cargo to rivers and lakes, the natural sources of water supply, where, if the volume of water is not adequate to sufficiently dilute it, or the amount of oxygen contained in the water and its rate of flow are not sufficient for self-purification, these micro-organisms having thus found a suitable media for propagation, multiply enormously, infecting and rendering positively dangerous an otherwise potable water.

Possibly only a few miles below the source of pollution may be found the intake of a municipal water-works system, pumping millions of gallons of this sewage-polluted water per day to its thousands of inhabitants, every gallon no doubt containing pathogenic bacteria, or when deposited in the old-fashioned out-door vault, "constructed for the avowed purpose of retaining the solid matters as long as possible upon the premises, they become centers of pollution and infection. The liquid portions escaping, pollute the soil and neighboring wells; the noxious exhalations arising from their putrefying contents contaminate the air."—Samuel M. Gray.

It has been pretty well established that water derived from uninhabited regions is harmless so far as the presence of pathogenic bacteria is concerned, and while all surface waters contain varying amounts of micro-organisms, the ordinary river water bacteria is not pathogenic. It is only water that is infected, or liable to infection from too close proximity to human habitation, that needs to be feared.

And "since it seems to be proven that the great majority of pathogenic bacteria which are likely to be water-carried are voided from the system with bowel discharges, and these discharges are found most commonly in sewage, it is sewage-polluted water that is most likely to be the carrier of infection."—T. M. Cheeseman, M. D., "Common Causes of the Contamination of Drinking Water."

Millions of bacteria, mostly colon bacilli, always exist in the alimentary canal, and the excreta of a healthy person contains on an average about 200,000,000 bacteria per gram. "Assuming that a man discharges about 200 grams or 7 ounces of faeces daily," this would give 40,000,000,000 bacteria discharged by one person each day.

The number of bacteria actually found in sewage, as a rule, greatly

CONCRETE BRIDGE IN FOREST PARK, ST. LOUIS

exceeds this amount. By a series of counts made from the excreta of typhoid fever patients in the Lawrence City Hospital during 1891 and 1892, the average number per gram was estimated to be about 1,000,000,000, and this discharge from a number of patients being emptied into a water course would go a long ways toward putting one or more pathogenic bacteria into every gallon of water used.

The number of bacteria found in river water depends much on the amount and periodic intensity or precipitation, and the character of the surface of its drainage area, being usually lowest in summer, due to the lesser amount of rainfall and the destructive action of the sun's rays. Direct sunlight has a very powerful germicidal action, experiment having demonstrated its effect on micro-organisms, to a depth in clear lake water of eight feet.

Water containing pathogenic bacteria is not only dangerous as a drinking water but may communicate disease in other ways. A question that is becoming of importance to a number of our sea-board cities and towns is the contamination, by sewage, of the oyster beds. It is not only receiving the attention of oyster growers, but, justly as as well, of the different state boards of health, for the purpose of protecting the public from sewage-polluted oysters. While water containing sewage does not seem to be harmful to the oyster itself, it affords a means for conveying harmful bacteria from the sewage water to the human body. Foote, of New Haven, demonstrated, by laboratory experiments, that the typhoid baccilli will live in oyster water for a period of eight days, and that injected into the oyster will remain abundant for several weeks.

Milk is another article of food that is so liable to become contaminated, and being a favorable media for the growth of micro-organisms, has probably conveyed more disease from impure water than any other food. The writer has in mind an instance of where an epidemic of typhoid fever was started by a milkman washing his cans in water that was subsequently found to have contained baccillus typhosis. Hence arises the necessity of studying nature's laws, and using her agencies in effecting a disposal of those organic matters, in such a manner that they shall lose permanently their power of producing or abetting disease. If the people of the United States would lay aside for a moment their all-absorbing financial and political problems and figure a life at what it is worth, and then think of the awful penalty in human lives that is being paid annually for their seeming indifference and negligence, the most heartless could not help but be awed. The number of fatalities in our recent war with Spain becomes insignificant in comparison with the needless sacrifices annually to water-communicable diseases.

Of course, all cases of enteric diseases can not be traced to the use of infected water, but the cause of many typhoid epidemics has been traced so positively to a water supply having become contaminated by sewage containing typhoid bacilli that there is no longer any question as to the fact of such epidemics being spread through the medium of water supplies; and statistics prove that the mortality from this cause can be reduced by proper and adequate means of sewage disposal and water purification.

As civilization advances and the urban population increases the demand for a more abundant supply of water becomes more urgent, while

TW , ST. LOUIS, PAVED WITH ASPHALT.

at the same time the risk of sewage pollution of such supplies increases, and two ways suggest themselves for solving this problem: First, treat the sewage before discharging it into the water course by that form of disposal or treatment best adapted to the local conditions, so that all obnoxious substances have been removed; or, obtain a supply of pure water, by filtration through a suitable material which retains or removes its impurities, or a rock water, where possible, by means of deep water wells. "With some European rivers the purification of both sewage and river water is insisted upon, thus giving a double line of protection, which is certainly advisable in cases of very dense population upon water-sheds. This problem must be considered not only with reference to water supplies now taken from streams, but also with reference to those cities which may ultimately find themselves compelled to use river waters, although not at present so supplied."—Allen Hazen.

River waters should invariably be filtered when used as water supply, and this plan of purifying both sewage and water is becoming more popular in this country. The effect of the filtration of water upon the death rate from typhoid fever is well illustrated in the following table, showing the death rate in London previous to the adoption of sand filtration for the purification of its river waters, and also the rate after the use of filtered water:

	Death rate.	
1841–1850....	9.8	Ten years previous to filtration.
1851–1860....	8.7	A reduction of 11.2 per cent.
1861–1870....	...	
1871–1880....	2.4	A reduction of 75.5 per cent.
1881–1890....	1.9	A reduction of 80 6 per cent.
1891–1896....	1.4	A reduction of 85.7 per cent.

The above rates are per 10,000 of population. This shows a reduction in the death rate from this one disease alone of 85.7 per cent. since the introduction of filtration. The following from Albany Medical Annals of March and April, 1897, gives about the average death rates from typhoid fever, of several cities in the United States obtaining their supply of water from adjacent rivers or lakes:

Allegheny	11.23	per 10,000
Denver	21.7	" "
Washington	4.6 to 6.7	" "
Jersey City.....	6.0 to 7.6	" "
Philadelphia	3 24 to 4.08	" "
Baltimore	5.00	" "

Chicago furnishes a very instructive example of the relation of impure drinking water to typhoid fever. The city pumps its supply of water from lake Michigan, and previous to 1892 the cribs of the water-works system were close in shore and the water sewage polluted. In 1892 the city completed two out of four projected new intake tunnels, receiving its supply from about four miles out in the lake, and the following very clearly shows the result. The death rate from typhoid fever per 10,000 of population during the years 1890, 1891, and 1892 was 11.5; the number of deaths in 1892 being 1,489. In 1894, the rate had fallen to 3.1, demonstrating clearly the effect of a purer water.

The last few years has seen an excellent beginning by a number of states toward a systematic study of the sources and contamination of public water supplies, with the idea in view of bringing them as near as possible to the ideal conditions of a pure water supply.

The laws of a number of states require that the state board of health shall examine and pass upon all projected water supply and sewerage systems, and this plan tends to the abolishment of the once universal and selfish practice of dis-

TELFORD PAVEMENT ON WASHINGTON BOULEVARD, ST. LOUIS.

charging crude sewage into the nearest stream, whether it was used as a source of water supply by other communities or not.

Municipalities, as a general rule, are much more selfish than individuals, and so long as they have danger removed from their own doors, they care not to whose lot it may fall. Here is where the state board of health steps in and protects us one from another.

Where a city is badly sewered, or has no system of sewerage whatever, an abundant supply of pure water will not always diminish the death rate from enteric diseases.

What is needed is that those in authority be furnished sufficient evidence to induce them to institute those other necessary reforms, in conjunction with a pure water supply. There will then be no reason why our cities and villages should not have as low a mortality from water-borne communicable diseases as is possible.

VALUE OF STREET SWEEPINGS.

By Edward A. Oldham.

The department of agriculture has been investigating the subject of the fertilizing value of city street sweepings. The work has been done by Mr. Ervin E. Elwell, the first assistant chemist of the department, under the immediate supervision of Dr. H. W. Wiley, the chief chemist. The information gathered will be of inestimable importance to city officials, to farmers and to gardeners.

In compiling the data in regard to the disposition of street sweepings, the chemistry division divided the methods of disposal into three classes: utilization for fertilization, utilization for filling low land, and dumping them with no regard to the possible value of the materials. In regard to the first of the three, which was the object of the investigation, the report states in general terms, that the cities representing one-fourth of the population of the country make an effort to utilize the fertilizing value of some portion of their street sweepings. According to the figures received from the citizens reporting, the average quantity of sweepings collected annually is 168.9 tons per 1,000 inhabitants. Assuming this to be a true average for all the cities of the United States, the total quantity is estimated as being in the neighborhood of 1,000,000,000 tons.

The investigation developed the fact that the value of the street-sweepings as a fertilizer is determined largely by the nature of the pavements, being practically nothing in the case of material collected from macadamized roads, and approaching that of good stable manure in the case of accumulations on the hand-swept and well-paved streets of crowded cities. It is observed that the regulations in different cities as to the nature of substances that may be thrown upon streets and into alleys vary so greatly that there is a corresponding difference in the cost of sorting and preparing the material that may be used as fertilizers. It is believed that the rapidly increasing sentiment in favor of the utilization of all forms of city waste will tend to remove this difficulty and thus increase the value of

THE FIRST BRICK PAVED STREET IN ST. LOUIS—WATERMAN AVENUE.

sweepings, particularly of those collected in alleys, when the percentage of miscellaneous rubbish is now often very great.

Chemical analyses of the sweepings of the streets of Washington City show that they are composed of moisture, ash, organic matter, phosphoric acid and potash. A similar analysis of the asphalt paved streets of Berlin, made by Vogel in 1892, showed, in addition to this range of composition, ammoniacal nitrogen, lime and magnesia. A sample taken from the accumulations of four weeks on the streets of Trenton, New Jersey, showed 18 per cent. of nitrogen, 30 per cent. of phosphoric acid and 19 per cent. of potash. In the opinion of the Agricultural Experiment Station of the state, this material, as a fertilizer, was worth ninety cents per ton.

In addition to this analytical data, the agricultural department embodies in its report upon the value of street sweepings as fertilizers, the results of numerous practical tests made by farmers in all parts of the country, with a view to determining the value of street sweepings as a source of plant food for field and garden crops, and as a source of the humus so necessary to a good mechanical condition of many soils. A farmer writing from Atlanta, Ga., informs the department that he finds a ton of sweepings equal to about half a ton of housed stable manure when composed of two-thirds cow and one-third horse manure. To be of this value, however, the sweepings must be gathered in the spring, fall and winter months from clean pavements. Those secured from pavements made hot by a summer sun lose in a great degree their fertilizing qualities. This farmer has used sweepings for three years, for corn, oats, wheat, rye and potatoes, broadcasting about twenty tons to the acre on semi-clay and sandy lands, which he declares have been greatly improved, more than doubling their yield. On much of his land he follows these first crops with a second crop of corn without additional fertilizer. Its cost has approximated seventy-five cents a ton.

Another farmer, writing from the same town, and using the sweepings from its streets, reports that he broadcast them on his land in the proportion of thirty-two-horse wagon loads to the acre, and planted the land in winter grazing oats. On a portion of land immediately adjoining this tract he placed no street sweepings at all, although the land had been planted in peas the year before. When he thrashed his oats, early in June, the tract upon which the street sweepings had been broadcast produced within a slight fraction of fifty bushels per acre, whereas that which had no street sweepings produced only seven bushels per acre, a fact which he regards as an overwhelming proof of the value of street sweepings as a fertilizer.

This same farmer had grown, on land fertilized with sweepings, sorghum millet, and has secured what is estimated as a phenomenal yield, and has also met with great success in growing peas under the same conditions. "The finest upland corn ever seen" in that locality was raised by him on a tract fertilized by sweepings. These, however, he plowed under eighteen inches in the December before planting, and he believes the store of moisture secured by this deep plowing may have assisted the sweepings to produce the corn.

A Rhode Island farmer testifies that he has used street sweepings for four years, and finds them bet-

TELFORD PAVEMENT ON LONGFELLOW BOULEVARD, ST. LOUIS.

ter than stable or horse manure, for the reason that they contain no straw, and are ready for use at any time. Using sweepings for corn, he has raised ninety bushels to the acre. In a bad corn year he secured sixty bushels to the acre. Growing oats for fodder he obtained four tons per acre. Grass yielded two or three tons per acre. With sweepings as a fertilizer he has no trouble in raising any crop he wishes.

A California farmer writes that he has this year put street sweepings on his hop hills, without pulverizing or working over, and has great faith that the results will satisfy his expectations. An Ohio farmer writes that he uses them, without preliminary treatment, on garden crops, and considers them very valuable. A Pennsylvania farmer has used nothing but sweepings as fertilizers for four years. A briar patch, upon which nothing would grow, produced forty-five bushels of oats to the acre when fertilized with sweepings, and a very heavy crop of English clover. Virginia cultivators have found them valuable as top dressing for grapes, and they have been used in that state with profit on spinach, cabbage, kale and potatoes. For spinach it is used broadcast, and in the same manner for potatoes and kale.

The park superintendent of Pittsburg informs the department of agriculture that they find sweepings an excellent fertilizer for their park soil. The sweepings are kept a year before being used ; they are then applied as a top dressing or to mix in with soil in breaking up land. Used in this manner, it is found to be powerful and quick in action, gives a full growth of grass of a rich green, which withstands drought well.

Sixteen cities reported the price at which street sweepings are sold to farmers by their street cleaning departments. The prices vary from fifteen cents to two dollars a ton. The city of Atlanta has disposed of its sweepings for sixty dollars a year and an arrangement which gives the street cleaning department the advantage of a short haul.

ELECTROLYSIS OF CAST-IRON WATER PIPES AT DAYTON, O.*

By Harold P. Brown, Electrical Engineer, New York.

The injury of water pipes by electrolysis is at present so well understood that my only excuse for again calling your attention to the subject is found in the peculiar and unusual conditions disclosed at Dayton, Ohio, in an examination made last July.

All of us know that electrolysis may be expected to injure lead and wrought-iron pipes on the lines of electric roads within a radius of half a mile from the power house, but we have believed that cast-iron mains were safe.

Our faith has been rudely shaken by the condition of those pipes at Dayton. They appeared to be entirely uninjured and the black paint seemed to be unaffected. But on scraping the pipe with a knife, the metal was found so soft that grooves could be cut into it. Therefore sections were removed for mechanical and chemical tests and the results fully justify your most care-

*Read before the American Society of Municipal Improvements, at its fifth annual meeting in Washington, D. C., October, 1898.

ful attention, since your own pipes may perhaps be in a similar condition.

Dayton is a beautiful city with a population of about ninety thousand. Its streets are remarkably well paved with granite blocks and asphalt, having foundations of unusual thickness and solidity. The large number of modern sky-scraper office buildings and handsome stores in the business portion give it quite a metropolitan appearance. It has fully eighty miles of electric roads and over two hundred and twenty-five cars.

Electrically considered, it is cut into four parts, by the Stillwater and Mad rivers, which unite to form the Great Miami, and by Wolf creek, meeting the Miami two miles or so below.

Three of these parts are further subdivided by canals. The business portion of the city is thus practically located upon an island, and the electric current used by the street cars must follow the rails across bridges or pass on the pipes under the river to get back to the power-house.

Practically ninety per cent. of the entire current from the business portion of the city crosses the river on one 12-inch and one 10-inch water-pipe, one 8-inch gas-pipe and one 10-inch natural gas-pipe.

The two main power-houses are about one-quarter mile apart on the west side of Miami river. A third but smaller power-house is on the east side of the river, but quite a distance south of the business portion of the city. Two other roads have their terminals in Dayton, but their power-houses are elsewhere.

AN OLD MACADAM PAVEMENT IN NEW YORK CITY.

Following my ordinary methods, a switchboard was mounted on a wagon and provided with a complete set of Weston electrical instruments, reading from one-ten-thousandth part of a volt per degree up to 750 volts, and from ½ an ampere to 150 amperes.

At each hydrant along the electric roads of the city, a reading

was taken from the trolley wire to each of the four rails; from the trolley wire to the pipe and from the pipe to each of the rails. These measurements were made in sets of three in such a manner that any poor contact, or any defective condition of the testing apparatus was at once indicated and corrected. The instruments had recently been compared with standards, and were known to be correct.

Over twenty-five hundred electrical measurements were made, and the results of the readings were plotted out upon a map of the city. On this map the measurements in the danger district, where pipes are positive to the rails, are marked in red, and where uninjured, in green ink.

Fifteen excavations were made and the measurements repeated on the pipes themselves. These excavations are marked on the map with a cross, either red or green, as the pipes were found injured or uninjured. A careful examination was then made of the physical condition of the pipes by J. H. Shaffer, metallurgist, and chemical analyses were made of samples of soil and the metals of the pipes and incrustations upon them. These were made by E. E. Brownell, E. E., and James O. Handy, chief chemist.

These electrical tests showed that the pipes in the business portion of the city, 1½ to 2 miles from the power-houses, were positive to the rails and therefore subject to electric corrosion. The highest readings in this part of the city were 4½ volts near Fifth street bridge, and near Washington street bridge. Near the power-house on the west side of the river, the pipes were 9 volts positive to the rails, and the danger district extended about ¾ of a mile to the west. In the southern part of the city the highest positive reading was 2 volts in front of the Oakwood avenue power-house.

In making the electrical tests, the time of the reading was noted, since the pressure depends on the amount of load carried at the power-house, and will vary correspondingly in all parts of the city. For instance, in front of the power-house of the People's railway, on Washington street, at 5 P. M., during the heavy load the pipes were 9 volts positive to the rails, while at 2 P. M. they were but 6 volts positive.

It was at once evident that the danger district was extremely large, since the entire area marked in red is in such an electrical condition that lead and wrought iron pipes would be injured. This was verified by the records of the water board, which showed a large number of service pipe renewals. These renewals are very expensive in Dayton, because, as previously stated, the foundations of pavements are unusually heavy and unusually well constructed.

The board of water-works very wisely refuses to allow any one to tear up the pavements. When a permit for excavation has been secured, only the trained employes of the paving department are allowed to remove the paving. After the work is completed, no one but these same employes can fill in the hole and replace the pavement. This replacement is so well done that no traces of the excavation are evident.

Unless a remedy for the electrical condition of the pipes is very quickly applied in Dayton, it is certain that a large amount of excavating, replacing of pipes and paving will need to be done.

Cast-iron pipe is usually little af-

fected by electrolysis, since the coating of adherent moulding sand and tar paint protect it.

In the ordinary soil an iron pipe submitted to electrolytic corrosion is covered with a layer of iron oxide which is a poor conductor of electricity, so that with a given pressure, the deeper is the layer of rust and the slower the rate of corrosion.

But, to my surprise, the soil surrounding pipes in Dayton gives an entirely different reaction when a current passes through it. The tar seems to be no protection whatever and the surface of the pipe in the danger district is changed into a soft black material resembling graphite, and easily cut with a knife.

This material is such an excellent conductor that, instead of checking, it tends to increase the action by reducing the resistance of the path through which the current must flow in order to reach the rail. Moreover, the stones and pebbles near the pipes are actually electroplated with the metal of the pipe, whether iron or lead, as can be seen from the samples exhibited. This condition I had never before seen, and as far as I know it has not been previously reported.

Since my Dayton report was published I have received a letter from Mr. Dabney H. Maury, Jr., superintendent of the Peoria Water Company, Peoria, Ill., in which he states that he has encountered the same phenomenon.

In order to electrically deposit a layer of metal, two things are necessary: first, a liquid which will dissolve the metal, and, second, an electrical current exceeding 0.01 of a volt in pressure, flowing away from the metal through the liquid.

LAYING AN ASPHALT SURFACE ON BINDER COURSE ON A MACADAM PAVEMENT IN NEW YORK.

The fact that the pebbles are electro-plated showed that both these conditions exist, but in order to prove conclusively that the soil itself did not injure the pipes, a pipe surrounded by the same soil was uncovered in another portion of the city where there was absolutely no trace of an electrical current.

This pipe was on Logan street, near the canal; the records showed that it was put down in 1874, while

the pipe taken out at the west end of Fifth street bridge had been in use ten years and exposed to electrolysis for four years.

If the damage was caused by the soil itself, this pipe would, of course, have been in a worse condition than the Fifth street pipe. But the Logan street pipe was apparently as good as new.

To make the comparison absolutely beyond criticism, a section of each pipe was taken out, chemically analyzed and mechanically tested. The chemical analyses of the iron pipes were nearly identical and are as follows:

	Logan St. Pipe.	Fifth St. Pipe.
Phosphorus	.789%	.800%
Sulphur	.073%	.057%
Silicon	2.270%	2 500%
Iron	not det.	not det.
Carbon combined	.13%	.24%
Carbon graphitic	3.43%	2.88%

The samples of the incrustation of the Fifth street pipe analyzed as follows:

Phosphorous	1.821%
Sulphur	none.
Silicon	not det.
Iron	33.43%
Carbon combined and carbon graphitic	7.12%

This analysis showed that the percentage of iron was greatly diminished while the percentage of carbon was more than doubled.; careful investigation showed that the carbon was merely the amount originally in the pipe, the carbon being left, while a large portion of the iron had been carried away.

The chemical analyses of the soil showed that the solvent was produced electrically from carbonate of sodium and chloride of sodium in the soil. Neither of these by itself, in the small proportion shown by the analysis, would injure a cast-iron pipe covered with tar, though, as is well known, a strong solution of chloride of sodium or common salt will rust wrought iron.

But the presence of even 0.01 per cent. reduces the electrical resistence of the iron and the passage of the current decomposes these salts and forms muriatic or hydrochloric acid, which dissolves the metals. Having thus determined the cause of the trouble, it remained to fix its extent. Fifteen excavations were made in different parts of the city to determine how much electrical pressure is required to seriously injure the cast-iron.

A pressure of three volts and less is found to cause a graphite coating not exceeding 1-32 of an inch in depth; the iron seems to be uninjured.

From 3 to 4½ volts, the thickness of the layer is increased in a ratio depending upon the length of time during which the pipe has sustained this pressure. With a knife or file, soft spots can be found in a pipe from 1-16 of an inch to ¼ of an inch deep.

With higher electrical pressures the extent of the injury is even greater. In all cases the damage is directly proportional to the pressure and to the length of time during which the current has been flowing, while it is inversely proportional to the distance between the rails and pipes.

In my opinion all mains and service pipes in Dayton are seriously injured where submitted to 3 volts pressure, or more, for 2 or more years when within 4 feet of the rails.

This would mean less than one mile of mains, but with lead or wrought iron service pipes, the pressure limit should be as low as one volt. Mr. Chas. E. Rowe, secretary of the water-works, however, feels that 17,513 feet of mains should be replaced at a cost of 77,000.

To determine what percentage

of mechanical injury had been sustained by the pipes, it was intended to compare the hydrostatic pressures required to rupture the Logan street and the Fifth street pipes, but defects in the apparatus employed prevented a fair test.

The Fifth street pipe at 150 pounds pressure leaked through the corroded spots, while the other pipe was able to stand 300 pounds pressure. Test bars were cut from the best portions of both pipes and broken on a Riehle testing machine. The average transverse strength

FINISHED ASPHALT SURFACE ON A MACADAM PAVEMENT IN NEW YORK CITY.

of the Logan street pipe was 1,800 pounds per square inch, as against 1,085 pounds to the other.

The tensile strengths were respectively 16,000 and 11,425 pounds, and the deflections were 0.25 and 0.20 of an inch. Four years of electrolysis had robbed the Fifth street pipe of about 30 per cent. of its transverse strength and about 45 per cent. of its tensile strength and had caused it to leak at 150 pounds pressure.

Since I wished to avoid any suspicion of unfairness I asked the managers of each of the three leading electric roads to allow their experts to accompany me and to check my instruments, methods and readings. This was cheerfully done, and I received from these gentlemen full information concerning their plants and connections, as well as every possible courtesy during my examination.

The rail joints on several lines of road had recently been removed, the rail ends brightened with the sand blast and the "cast-weld" joint applied. This was done by the railways with an idea that it would reduce electrolysis as well as make a fine mechanical joint. It was a success mechanically, but was an electrical failure, as was shown by tests of individual joints and by electrical measurements of several stretches of 1,000 to 1,200 feet of each of the four rails and of the pipes below them.

The measurements were compared with others made last February on the same rails before the "weld" was applied, when very small bond wires were used on the rails. There was practically no variation in the results as would

have been the case had the "weld" possessed high electrical conductivity.

I found that two of the rails were carrying no current whatever, while the other two carried but one-twentieth of the amount of current on the pipes below them. And yet some men will tell you that a "weld" can be made by pouring sixty or seventy pounds of molten iron around forty or fifty pounds of cold steel rails buried in moist earth!

I feel confident that if the railroads would unite in the expenditure of five to seven thousand dollars for the proper electrical apparatus and connections, all the water pipes in Dayton could be maintained negative to the rails.

Then the pipes would harden. Moreover, any further electrolysis that might occur would be in the opposite direction, and would therefore add a layer of metal to the pipes instead of injuring them. I will not here enter into discussion of the electrical methods required in Dayton to obtain this result, but it is evident that no plan heretofore suggested for electrolysis prevention will effect a cure there, owing to the unusual conductivity of the soil and the peculiar division of the city.

But I would like to offer a few comments and four or five practical suggestions. Do not imagine because your pipes are not leaking and bursting that they are safe from electrolysis. If the electrical conditions are against them, they are getting weaker day by day. On the other hand, do not antagonize the railway companies the moment that the subject of electrolysis comes up in your city. They are not intentionally injuring your property, and if a friendly talk is had and a joint investigation is made, you are likely to get the speediest and most satisfactory action.

The railway manager is as much interested in stopping the trouble as you are; every pound of metal taken from your pipes means to him a heavy loss of power, increased investment for engines, boilers, dynamos and conductors. And if it is finally established by legal decisions that his current has injured your property, he will have to settle the bill.

The best course for all concerned, it seems to me, is to take mutual action while that bill is small, and not wait until a bursting main during a fire spreads the loss over the entire community. The usual procedure brings a dead lock. The water-works people discover signs of electrolysis, and at once pounce upon the railway managers. These either refuse to believe that they are responsible for the trouble, and thus bring upon themselves a shower of threats, or they say that although they can not admit the fault is theirs, they are, nevertheless, willing rather than earn the ill-will of the public, to do anything in reason if the others will only tell them what to do. Then the others suspect some cunningly hidden legal trap, and decline to give any directions whatever. And so nothing is done!

There seems to be an idea prevalent, that if the water board suggests to the railway any scheme for stopping the trouble, and the scheme is then tried, and fails, the railway is thereby freed from all future responsibility.

How any one can believe that the mere following out of a plan of experiment would cancel indebtedness is beyond my understanding. It is giving a legal tender value to the acceptance of a suggestion, which seems to have no basis in

fact, in equity nor in law. But this idea has cropped out in so many cities that I rather hesitate about offering the following practical suggestions:

1. It will not be a mistake to follow Dayton's example and obtain complete and accurate information concerning the electrical, chemical and mechanical condition of your pipes, especially in the vicinity of the power-houses. The trouble may be confined entirely to the lead in the service pipes, and in the calking of joints on your mains; but even here serious damage may result if the matter is neglected for years.

2. Do not put down any more lead or wrought-iron service pipes, as these are the first victims of electrolysis and their replacing means ruin to pavements. Use instead wooden pipe, banded with a close spiral of hoop iron and covered heavily with asphaltum. This will stand the heaviest pressure in use and is not affected by electrolysis since the hoop iron is low in conductivity and is not electrically connected at the joints. Its cost is said to be reasonable and it has a successful record of many years' service.

3. Use the same kind of pipe for new mains in any district in which a railway power-house is likely to be erected, and heavily paint the lead calking of cast-iron mains, using asphalt or petroleum wax.

4. In the danger district, along the lines of electric roads and on intersecting streets, put into your water and gas mains two or more consecutive lengths of these wooden pipes, so as to break the electrical continuity of the mains, and thus make their resistance greater than that of the rails. Fill in the space around them with broken stone and connect with drains, if possible.

5. Midway between the wooden sections on each main attach insulated pilot wires, leading to a central office. Connect similar wires to the rails nearest the pipe-wires and make daily electrical tests at times of heavy load. If any section shows positive to the rails, cut it at once into smaller sections and call upon the railway to rebond its lines upon that street.

This, with the proper electrical management of the railway feeder-wires and apparatus, will effectively protect your mains.

A MODEL PROGRESSIVE TOWN.

By W. H. Tribolet.

Bluffton, Ind., is in size a town of 5,000, in point of population like hundreds of other small cities in the country, quick to boast and vaunt of their advantages and their growth, which always is, "No boom, but a steady and substantial increase." It has its court-house, which is better than the neighboring county-seat; its inhabitants are a grade higher in intelligence, push and energy than those of any other town, and possess all the other incentives to braggadocio. No town exists that is not better than some place else. If it were not so the people would all move to the other town.

But Bluffton has one characteristic and one boast that does not stop at ordinary limits, but is world-wide. With a population of 5,000 Bluffton has a fraction over three miles of asphalt streets, more as-

phalt pavement and cement sidewalks than any city of its size on the globe. The assertion is made fearlessly and no rival has ever stepped forward to dispute the claim, sweeping as it is.

Prior to 1897 there were no cities in Indiana, and very few, if any, in the United States, the size of an ordinary country town, that possessed an asphalt street, and for that reason a new era dates from the first street that was built in Bluffton. It marks an era because it has been demonstrated that small towns can enjoy good paving as well as metropolitan cities, and that, too, without bankruptcy or the confiscation of homes. While not a wealthy place, in truth, only the central point in a rich agricultural section, the city of Bluffton, with over three miles of paving, built at a total cost of $160,000, has paid over one-half in cash, and there have been no delinquencies on the first installment of deferred payments. The future can only be judged by the present.

A history of the inception of street building, the struggle of the movement, its final successful accomplishment and the results may be of value to numerous cities that contemplate paving, asphalt or otherwise. Bluffton made its initial start in 1896, when contracts were let for a sanitary and storm sewer at a cost of $70,000. The one was eleven miles in length, the other six miles. The necessity of a thorough sewer system before paving is so apparent that it bars discussion. For several years the subject of better streets to replace the old macadam mudholes had been agitated. In the spring of 1896 it took on a more fevered state, and the discussion of the respective merits of block, brick and asphalt became heated. Finally, a committee of five business men—a lawyer, a cashier, a druggist, an oil man and a banker—volunteered to make a tour of inspection at their own expense, and lay before the council the results of their investigation. They visited the larger cities of the east, with Indianapolis as their only western point, and unanimously rendered their verdict in favor of asphalt.

A short while after the city council made a similar trip, and in the spring of 1897 ordered the improvement with asphalt of five streets, two in the business portion of the city and three in the residence part. In the latter was one continuous avenue about one mile in length. There were two bidders, the specifications limiting the bids to Bermudez and Trinidad lake asphalt. The Indiana Bermudez Co., of Indianapolis, secured the work at $1.87 per square yard for the pavement, 75 cents per lineal foot for cement curbing and 15 cents a square foot for cement sidewalks. When finished an overwhelming desire was created in the hearts of the residents on other streets, and citizens from three of these thoroughfares appeared before the council with petitions bearing the signatures of over seventy per cent. of the property-owners, and the improvements were ordered. Two of the streets, Wiley and Central avenues, were secured by the same concern that built the other streets at $1.75 per square yard. The Warren-Scharf Co. bid $1.73, and injunction suits immediately followed. The ground of the suit was based principally upon the allegation that the city had exceeded its legal limit by incurring the cost of the street and alley crossings, which expense fell upon the corporation. Upon this point Judge Vaughn ruled as follows:

As respects the expense for so much of street and alley improvements as shall be occupied by the street and alley crossings, Judge Mitchel decides in the case of *Quill* v. *City of Indianapolis*, 124 Ind. page 301: That it is apparent from the whole scope and tenor of the Barrett law, that the corporation becomes liable to pay that in cash upon the completion and final estimate of the work, or as estimates therefor may be made from time to time. This being so, no debt therefor results on that account. An improvement of street and alley crossings by the city must be paid from the current revenues. An obligation to pay for the work when it was performed does not constitute any indebtedness within the constitution. 27 Iowa, 227.

When a contract made by a municipal corporation pertains to its ordinary expenses and is, together with other ke expenses, within the limit of its current revenues and such special taxes as it may legally and in good faith intend to levy therefor, such contract does not constitute the "incurring of indebtedness" within the meaning of the constitutional provision limiting the power of municipal corporations. Section 88.

If the contract and engagements of the municipal corporations do not over-reach their current revenues, no objection can lawfully be made to them, however great the indebtedness of such municipalities may be, for in such case their engagements do not extend beyond their present means of payment, and no debt is created. Leading case on this point, *City Valparaiso* v. *Gardiner*, 97 Ind. 1. Upon a change of venue to Jay county, Judge Headington sustained Judge Vaughn, and refused a restraining order.

In the residence portion the streets are 27 and 24 feet wide; in the business portion 44 feet. The cement sidewalks are 5 and 18 feet wide respectively. Entirely completed, grading side lawns, engineer's fees and all the cost on residence property is from $3.50 to

ASPHALT PAVEMENT ON MARKET STREET, BLUFFTON, IND.

$3.77 per lineal foot to the individual property-owner. In the business portion, where the walks are extra wide, the cost was $8.16. It is a remarkably poor business property with a frontage of 20 feet that wjll not stand an assessment of $160. For cleaning these three miles and more of street the city pays four scoop men $30 per month, a total annual expense of $1,440;

much less than the annual repairs on the old streets.

With three miles of street and and cement sidewalk, Bluffton makes two claims: First, that it is the pioneer of small cities in street building; second, that it is the "Asphalt City of the World," size considered.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

SPRINKLING OF SALT ON ASPHALT STREETS.

Does the sprinkling of salt on asphalt streets in winter time injure the asphalt? If so, how is it affected and what are the results? *W. J. Y., South Park, Chicago, Ill.*

Salt in small quantities, such as would be left from the evaporation of sea water used in sprinkling, does not seem to be injurious to asphalt pavements. The injury to pavements from sprinkling comes from poor drainage, causing water to stand on the pavement. The effect of water on asphalt is well described in an article by Clifford Richardson on "Softening Agents for Asphalt Cements," on page 343 of volume XII of MUNICIPAL ENGINEERING for June, 1897. Bad effects from sprinkling salt on asphalt pavements in winter would arise not so much from the salt directly as from the water produced by the melting of snow and ice which would find little opportunity to drain off if grades were light. Unless all water thus formed is promptly drained away, a gradual softening and disintegration of the asphalt may be expected. Sweeping the snow from street car tracks and sanding icy pavements are better methods of treatment than sprinkling with salt, and they will probably be less expensive if proper provision is made in advance for doing the work. The injurious effect of the salt water, which has a temperature very near zero as long as there is snow or ice to melt, upon horses' feet, should prevent the use of salt as described.

KEYED PAVING BRICK.

I have invented an anchor paving brick which provides for holding the brick together, as will be shown by a rough illustration, which I will send you. I would be glad to have an opinion from you regarding it. *P. B. T., Springfield, O.*

A number of designs for keyed brick have been proposed, but none of them have met with much favor. The defects in brick pavements are not due to any great extent to lack of adhesion of the materials of the pavement. There is an apparent exception to this along street car tracks, when the foundation for ties and rails is insufficient and the motion of the tracks displaces the brick. Here the force, displacing the pavement, seems to be too great for any keying device to withstand and the disturbance of the pavement is only delayed for a short time. The disease is not in the brick, but in the foundation of the track and the form and size of rail, and a remedy applied to the brick is only palliative and not curative. The expense of making the peculiarly shaped blocks, the difficulties in burning uniformily so that projections will fit depressions, the weakness of the small key in the design here suggested, and the additional cost of laying, all work against the acceptance of the design, even if it were the brick which needed modification of this sort, and the other parts of the pavement were perfect. Under the conditions existing it is more economical to add the cost of a good foundation and a proper rail than to add to the cost of the brick.

SMOKE PREVENTION IN CITIES.

The councils of this city have under consideration an ordinance to prohibit the emission of dense smoke from smokestacks, chimneys, etc. Our manufacturers of locomotives and other engines, car wheel works, etc., claim "that smoke consumers and such devices can not be applied to the chimneys of forges, heating furnaces, etc., without destroying their efficiency." One manufacturer says, "I have never known of its having been attempted anywhere in the world, and I am familiar with such operations as they are conducted elsewhere." Will you kindly inform me whether such devices are successfully used, and if so, where? Yours truly,

Joseph P. Phillips,
City Engineer, Scranton, Pa.

The question of smoke prevention is one which is receiving much attention. Practicable devices for diminishing the amount of smoke from fires under boilers and similar locations have been invented and are in use. The method of firing also has a very pronounced effect upon the amount of smoke. Such fires as those mentioned in the question are more difficult to manage. It must be recognized that the prevention of smoke costs money, either in providing the proper apparatus or in loss of efficiency. The city council must recognize the fact that a tax is put upon nearly all chimneys by demanding smoke prevention, and that this tax must be paid by the owners of the works unless a portion of the burden is borne by the city in some way. Whether the improvement in conditions is worth what it costs must be decided by each city for itself. Most cities are working toward complete prevention as rapidly as possible. Small fires can be taken care of by careful firing. Most boiler fires can be regulated by stoking apparatus, steam and air jets, by using producer gas, and in other ways, in addition to careful firing. Furnace and forge fires must be regulated by special means, few of which have yet been devised which approach efficiency, except the use of gas. Some valuable information on the subject can be obtained from the report of the St. Louis Smoke Committee of 1892. Descriptions of various smoke consuming and smoke preventing devices can be found in various numbers of *Journal of Association of Engineering Societies*, *Journal of Franklin Institute*, *London Engineer*, and others. New devices are frequently presented, both in this country and abroad.

PLANS FOR CITY HALLS.

Where can I find plans for city halls and building for fire-wagon, etc., for a city of from 7,000 to 12,000 population? This city is contemplating building some time this year. *E. E. Ward, Mayor, Brookfield, Mo.*

The architectural supplement of the *Scientific American* probably gives some views and general plans of such buildings. The best satisfaction will be found in consulting a good architect, who can design buildings suited exactly for the local conditions.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

BARBADOES GLANCE PITCH.

What is the special nature of Barbadoes pitch? Is it asphalt and is it good for paving? *M. T. T., Newark, N. J.*

This material is called asphaltum in the varnish trade. It is one of a group of bituminous substances to which many other hydro-carbons belong. It is similar to the brittle bitumens or glance pitches found in Utah, Mexico, Palestine and elsewhere. Its principal use is for the manufacture of varnish and paint. It is found in veins and occasionally in underground masses of from 20 to 500 tons. The veins vary from less than an inch up to a foot or more in thickness. Formerly it was found on the surface, but now it is necessary

to go deeper and most of the material is obtained through shafts and drift tunnels. Even if suitable for paving (which it is not), its cost would effectually prevent such use. It is a very pure bitumen and upon breaking has a brilliantly black, shiny lustre. It is very brittle and melts easily.

ASPHALT PAVEMENT ON M STREET, WASHINGTON, D. C.

I have noticed in the October number of MUNICIPAL ENGINEERING MAGAZINE, page 211, a picture of an asphalt pavement after twenty years' wear, which, to me, seems quite remarkable. Having been connected with the asphalt industry for a long term of years, can you tell me, authoritatively, by whom that pavement was laid? From what particular part of the asphalt deposits in Trinidad was that asphalt obtained? I say Trinidad because I have been informed that at that time no other asphalt was used in the District of Columbia.

New York. *Lamson.*

The records at Washington and elsewhere show that the asphalt pavement on M street, N. W., between 6th and 14th streets, was laid in 1878 under a contract taken in the name of J. S. Baldwin. The work was performed by Mr. A. L. Barber. The asphalt came from Pitch lake, in the island of Trinidad, B. W. I. Finlayson & Co., of Trinidad, sent the asphalt from the portion of the Pitch lake which they leased. It was purchased by Warren & Co., through Watson & Sons, of Philadelphia, and J. S. Baldwin obtained it from Warren & Co. This information is important as showing not only that the asphalt was carefully selected and refined, but also that the sand, limestone and other materials as well as the proportions of the mixture were carefully attended to, all of which, combined with good workmanship, produced the excellent results you mention.

NEW YORK CITY PAVEMENTS; HOW OBTAINED AND PAID FOR.

How does New York city under its new charter pay for its pavements? Under what special department are they laid? What are the methods by which pavements can be secured by citizens.

W. E. D., Morrisiana, Bronx Boro, New York.

The city of New York now pays for the repairs or maintenance of all pavements from general funds. If an old pavement must be replaced by a new one, this is properly construed as maintenance. Such pavements, replacing others, are paid for from the general funds, and if of asphalt, they are laid under a fifteen years maintenance contract. Pavements laid on streets which heretofore have not had any pavements, are assessed on the abutting property and are laid under a five years maintenance clause that the pavements will be kept in good order during and at the end of five years. This applies to asphalt. Granite is guaranteed for two years. Repairs to it are done by the city.

Provision is made in special cases for the expense to be divided between the property benefited and the city in proportions varying according to the benefit accruing. The city railways pay for the pavement between and for several inches adjacent to their tracks. But almost one million dollars is due from railways and very hard to collect. New York City, under its new charter, includes Brooklyn, Long Island City, Staten Island, etc., in each of which the details vary a little.

Cash paying funds are specially obtained by the issue of bonds specially provided for in sections of the charter 39, 48, 170, 176, 181, 390, 415, 422 and 948, which must be consulted by readers desiring complete knowledge of the matter. These sections also show how a

portion of the cost can be paid in certain cases instead of the whole cost being borne by the abutting property.

The board of public improvements, consisting of the mayor, corporation counsel and the comptroller can at any time inaugurate an ordinance for paving streets in any portion of the city.

It can also be done by the Municipal Assembly. But in cases where citizens desire pavements, provisions are made in sections 390, 404 and others, by means of which pavements can be obtained by petition—and this whether the petitioning property holders pay for the same or not.

The commissioner of highways has direct control of work on the surfaces of streets, including paving, and he can readily be consulted at any time by any citizen desiring information as to what is best to be done in special cases.

BY WAY OF COMMENT.

Compensation of Municipal Engineers.

An interesting table, presented by Mr. A. D. Thompson, in his paper on "Duties and Compensations of Municipal Engineers," in the January number of MUNICIPAL ENGINEERING, suggests some considerations which should be borne in mind in discussing the anomalies shown.

As regards the city engineer, it is too frequently the case that he is appointed largely for political reasons. This is very likely to be true where he is elected by the people, as in some Illinois cities. In such cases he attends to the political duties forced upon the office by the spoils system, and his technical duties are taken care of by subordinates, perhaps more competent than he, whose tenure of office is very likely to be more permanent than his own. The low salaries are not so badly out of place in such cases, but the salaries of the assistants should, at least in part, be added to the salary of the chief, in making a comparison with other cities of the cost of engineering supervision.

In other cases, particularly in the smaller towns, an attempt is made to have the actual engineering done by a non-professional commission, or council committee, the city engineer being relegated to the position of surveyor and office-assistant. Here, again, the salary will be low, and the salaries of the commission, if any, should be added, to give the whole cost of engineering supervision. If the money foolishly wasted by such commissions and committees on account of their ignorance of engineering were added to the salary of the "surveyor," the cost of such supervision would far exceed any given in the table.

The item of expense of the engineer's department is very elastic. Scarcely any two cities named in the table include the same items in their statements. For example: One city includes all engineers, draftsmen, rodmen, chainmen,

helpers, inspectors, assessment clerks, chief clerk and all expenses for horses, transportation of all kinds, supplies for office and field; while another includes barely the engineering force down to helpers and office and field supplies, charging the other expenses to various other funds or directly to the property. Nothing short of an intimate knowledge of the customs in every city would enable one to make an accurate basis for comparison. The figures in Mr. Thompson's table are remarkably concordant when the vast differences in plan are considered.

It is seen from the table that there is no relation between the cost of engineering service and the amount of work done. There are at least two reasons for this. One is that inspection is omitted from some and is included in others. If it were included in all, the amount of work done would have more effect upon the cost of supervision. Another reason is that it is often a political necessitiy to retain employes during dull times, though there is nothing for them to do, and work must be manufactured for them or their time is given up to political service at the expense of the appropriations for the engineering department. Then, too, some departments are top-heavy with salaries, even though the chief engineer is not exceedingly well paid, as he must have a certain number of well-paid assistants, whose salaries are a constant charge whether work is brisk or not.

In a well-regulated office there is a constant amount, made up of the salaries of the chief and his principal assistants and one or more field parties, a small force of inspectors and one or more clerks which can not be diminished, as it is necessary to look after maintenance of works and the constant small calls upon the office. There is a further amount made up of the salaries of some assistants, field parties, inspectors and a few clerks, which varies with the amount of work done. The size of the constant amount depends somewhat upon the size of the city, but it also depends upon the method of organization of the office, the liberality of salaries, the amount of work expected of the men, and the influence of politics upon this last item and upon the quality of employes. It should depend only on the first three, in which case some connection between size of city, amount of work done and cost of engineering could usually be seen. Until politics and non-professional supervision are ruled out and some sort of merit rule governs appointments the present variations and anomalies may be expected.

Street Cleaning in San Francisco. The city of San Francisco began the new year with a new set of street cleaning specifications, which were prepared almost entirely by the Merchants'

Association and adopted by the board of supervisors for a period of two years. The peculiarities of the specifications show the abuses of the system in the past, by the provisions necessary to prevent those abuses in the future.

Apparently the contractors have saved water at the expense of dust to the passers-by for the amount of water to be used in sprinkling is quite definitely fixed. Laborers have been paid very low wages, have been required to pay commissions for retaining their places, and have been boarded by the contractor to his profit and their expense. These are corrected by fixing wages at $2 a day, prohibiting commissions under pain of forfeiture of contract, and prohibiting boarding of men by contractors except teamsters, the rates for whose board and lodging are definitely fixed. Hand sweeping is the method adopted, the condition of most streets rendering machine sweeping ineffective; white uniforms are required; considerable increase in the number of sweepings of many streets is made.

The Merchants' Association seems to be responsible for many reforms in city government in San Francisco, especially in connection with public work. It is a very public-spirited body, but its best efforts seem to be required for considerable periods of time to bring about reforms, so great was the need for reform when the association began its work. It is receiving well-deserved commendation from many sources outside the city, and is beginning to see the results of some of its labors.

The Sand in Asphalt Mixtures. Many practical asphalt pavement-makers have long recognized the fact that the sand, being about 90 per cent. of the entire pavement, is a very important ingredient. Their observation of the action of pavements made with the sands in various cities shows the necessity of careful selection of sand and change of formula of mixture to suit the characteristics of the local material. Experiment and observation have shown the desirability of fine, sharp, clean sand. Few have considered the matter farther than this. The paper by Mr. A. W. Dow before A. S. M. I. on "The Theory and Practice of Asphalt Mixtures," printed in our December, 1898, number gives a discussion of the reasons for the observed action of various kinds of sand and some additional valuable points which should be carefully considered by the engineers and others interested in the subject. It is not necessary to repeat Mr. Dow's paper here, but simply to call attention again to its value. The paper has been reprinted in whole or in part in several journals, which indicates its timely character.

Introduction of Meters. The superintendent of water-works in Richmond, Va., has inaugurated a custom which overcomes many of the

objections when change is made from flat to meter rate. He sets the meter one month before the change in rate is to be made, and demonstrates to the consumer the amount of waste, and gives him an opportunity to stop it before he begins to charge for the water by measurement. Great saving in water is frequently made, and the consumer has timely notice so that any complaints of overcharge are forestalled. This obviates much friction, and adds largely to the good standing of the meter system in the minds of the public, and to the popularity of the water-works officials.

Sewage Purification by Bacteria. The so-called bacterial methods of sewage purification are now receiving large attention. Many experiments are made both in this country and abroad, with varying degrees of success. The experiments of the Massachusetts State Board of Health on filtration of sewage have demonstrated that with proper materials and care a very pure effluent can be obtained. Where such thorough purification is demanded, works designed upon the principles developed in these experiments are constructed.

An example now under construction is the system for Clinton, Mass., a town on the water-shed of the Massachusetss metropolitan water supply. Careful tests were made of the filtering capacity of proposed grounds, and the works were finally located in the most advantageous place where the average rate of filtration of water under a head, equal to the thickness of the material, is 30 to 40 million gallons in twenty-four hours per acre. Twenty-five beds covering twenty-three and one-half acres, are constructed to filter the town sewage by the intermittent method. The works are constructed under the direction of the metropolitan engineers and largely paid for by that district. All possible precautions are, therefore, taken to secure complete purification.

In localities where such complete purification is not necessary similar constructions are made, but with less care in details, with less provision for intermittence of flow and for maintenance, resulting in less purification of effluent and greater nuisance on the beds. Many localities find these methods, when conducted so as to obviate nuisance, too expensive, and search for other methods working largely by bacterial action is brisk.

The city of Leeds, England, has been conducting some experiments on this line which are quite successful for the amount of purification required. The sewage is run through two beds, one filled with coke, three inches or more in diameter, and the second with coke from $\frac{3}{16}$ inch to 1½ inch in diameter. Each bed had a capacity before coke was put in of 174,800 gallons. Screened sewage gave better results than when the entire effluent was put on the beds. Periods of several days of rest at intervals were

also found to be beneficial. During the six months' trial there was one period of seven days' rest, and one enforced period of 38 days. The beds were filled 315 times, using 14,490,000 gallons. Analyses showed that of the solids retained by the bed with a large-sized coke, 80 per cent. had been consumed, and 20 per cent. remained in the bed. All the sludge retained by the fire-bed was consumed in the bed. It amounted to 16,700 gallons, about 33 per cent. of that retained by the preceding coarse bed. The effluent from the fine bed was satisfactory, except for the first two weeks after the long rest, and when there was a heavy flow of dye. Coarse fish lived in the effluent, and there was no sign of putrefaction in keeping. There was no intention to make drinking water and the effluent came within the English standard of one grain per gallon of oxygen absorbed in four hours, and one grain of albuminoid ammonia. Similar experiments at Manchester indicate sufficient purity of effluent to permit its admission into the ship canal with the probability of improving its waters.

New England Water-Works Association

The New England Water-Works Association holds monthly meetings, and has many subjects of interest to discuss. The present officers have added to the value of the meetings by restricting the major part of the discussions to a single subject and presenting the most valuable material obtainable as papers. Thus, at the meeting on January 11, valuable papers were presented by Dexter Brackett on the new cast-iron pipe in use in Boston, by George S. Rice, on the new forty-eight-inch steel force main for New Bedford, by L. M. Hastings, comparing steel and cast-iron mains, and by Frank A. McInnis, describing the new fire-protection system of Boston using salt water. The large number of members in close proximity, the variety of problems presented in New England and the enterprise of the water-works engineer, combine to make such frequent meetings successful. The society also holds an annual convention, which will meet in Syracuse, N. Y., this year.

Though the question of thickness of pipe is not very prominent in construction where the amount of pipe to be laid is small, Mr. Brackett's formula for thickness may be of interest.

The thickness of cast-iron pipe should be $\frac{1}{3300}$ of the radius of the pipe in inches multiplied by the sum of the static pressure and the pressure allowed for water hammer, with one-fourth inch added for deterioration, imperfections, etc. Water hammer is assumed to vary from 70 pounds for 42 to 48-inch pipe to 90 pounds for 20-inch pipe and 120 pounds for 3 to 10-inch pipe. According to this formula a 6-inch pipe with a static pressure of 100 pounds should have a thickness of $\frac{9}{20}$ inch, or a trifle over $\frac{7}{16}$, slighly heavier than many good specifications.

Mr. Hastings brought out the points that steel mains cost 20 to 30 per cent. less than cast-iron mains, for the same demands upon them.

This is true notwithstanding the fact that the rough interior of the steel pipes, on account of rings of rivets and lap of pipes, diminishes the capacity, so that for clean pipes the steel pipe must be perhaps 5 per cent. greater diameter. Cast-iron pipe deteriorates with age, and its carrying capacity is reduced by tuberculation, while steel pipe must be more thoroughly coated and is not so subject to diminution of capacity, so that the difference between the carrying capacity of the two becomes less in course of time.

Society Meetings. Indiana and Illinois engineering societies held their meetings on the 24th to 28th of January. Both presented programs with good subjects for consideration and good men to lead the discussions. The Illinois program is particularly full.

Roads and streets and their materials are prominent on the Indiana program, with lectures on water and sewage purification by prominent engineers from other states.

The first session of the Illinois meeting was given to county surveyors, the second to a discussion of ethics, including papers on engineering ethics, the "theory and practice of getting jobs" and improvement of the public contracting system, with general discussions on the ethical standards for work getting and legislative control of professional qualifications. It was as full a discussion of the subject as has been held by any engineering society. The second day was given to sewers, cement, paving and materials, and miscellaneous committee reports. The third day took up water-works and mechanical engineering subjects. Fuller comment on the proceedings will be made in the March number.

The Physical Condition of Havana. The reports of General F. V. Greene, and of Colonel Geo. E. Waring, as presented by his secretary, show the condition of cities south of the United States. Havana is doubtless one of the worst at the present time in many respects. The city has a fairly good water supply, designed and largely superintended during construction by an engineer from the United States, Mr. E. S. Gould. A history of the work, written by him for the Am. Soc. C. E., shows the difficulties met with on account of the peculiarities of Spanish methods, and gives a hint of the corruption among Spanish government officials. An American contractor had almost secured a concession for a sewer system before the recent war, and a contract for its construction, which would probably cost $7,000,000, and is still making efforts to complete the deal with the city government. The proposition included complete plans and specifications upon which bids were to be taken.

The contractor furnishing the plans is to have the privilege of accepting the work at the price bid by the lowest bidder, and if he refuses to accept, he is to be paid for his plans a sum to be determined by arbitration.

This is quite a new method of securing and retaining control of municipal work, and seems to have been very acceptable to the municipal government. It is to be hoped the example will not be followed elsewhere. Whether this contract is completed or not, steps must be taken at once for adequate sanitary drainage. During the war the concentration of population in the city under conditions exaggerating the unsanitary habits of the people, and the stoppage of the usual processes of cleaning, produced a fearful condition, which it is the first business of our forces to correct. This is being done at as rapid a rate as possible and at high cost, but is worth anything that it is necessary to pay. The present operations are limited to surface cleaning and disinfection. The larger problems are not so easy of solution and must be put into the most competent hands. One of the most serious questions is that of outlets for sewers. The most convenient receptacle for sewage is the bay, but this is almost land-locked and tideless, and has no current through it.

Years of discharge of flood waters, garbage and refuse into it, have partially filled it and seriously polluted its waters. Sources of pollution must be removed instead of added, unless some plan for adding large quantities of clean water could be devised.

Street paving must follow sewerage and street cleaning. Garbage collection and destruction must be rigidly enforced. Sanitary regulations of private buildings and grounds must be more than usually severe if the city is to be redeemed from its bad condition and kept in good sanitary condition. It is to be hoped that the best aid will be secured, and that the occupation by the United States will continue until good plans are reasonably well worked out. It is probable that the addition of many Americans to the population will insure continuation of good conditions when they are once thoroughly established.

Competition of Engineers. Another form of competition which engineers often encounter, especially in water-works and electrical work, is exemplified in the following description, which applies to occurrences duplicated many times each year:

Several engineers were invited to state the terms upon which they would undertake to prepare plans and specifications for construction and reconstruction of water-works. One gentleman guarantees that the work can be done at his estimate, agrees to do it himself at his estimate and charge nothing for the plans, and assures the water company that he can place the bonds to be issued to pay for the work if

he prepares the plans. He is employed at figures half or less than half those given by the engineers mentioned. In the report of the transaction it is not stated whether the gentleman in question is an engineer or not. Neither does there appear upon the surface any basis upon which the guaranties offered can rest. He has been able to convince the company, however, that his claims have a good foundation. The officers of the company have the reputation of being good business men, though they are quite ignorant of water-works matters in general and in particular, so it should be presumed that reasonably good business sense would be exercised.

This is a general description. It applies to many cases without the change of a word and to many more by changing company to city or town, and to still more by changing the party making the accepted proposition to contractor or contracting company.

There does not appear to be anything which an engineer can do in such cases. The whole matter is usually outside the lines of the engineering profession and no regulations, codes or ethical standards can be applied. Once in a while a competent engineer is directly concerned but usually he is conspicuous by his absence.

There are some firms of engineers and contractors who propose to furnish plans and to construct works who are able to furnish adequate guaranties of their ability and of the excellence of their work. It can hardly be considered a violation of professional ethics to enter into such business openly, but if the engineer is sent forward to secure the important advantage of making plans and specifications by promising low cost for them and large advantages from his favorable connections, he is in the position of playing one client for the benefit of the other, and his ethical status is too low for serious consideration, unless there were some means provided to drop him from the company of engineers in good standing.

Perhaps it is a gambling instinct in men which leads them to put their money into the control of a plausible man who promises large returns for small outlay. Certainly many corporations seem to be conducted on the principle that what is everybody's business is nobody's business, and so the company will do business in a manner which the members of it would consider incompetent or even disgraceful in their private business. This is especially true of semi-public companies, such as local water companies formed partly to benefit the town, and is even more pronounced in business conducted by municipal officers.

The situation is still less pleasing, because there is little disposition to profit by the experience of others. The same scheme may be worked, often by the same parties, in all the towns in a large district and even upon companies in the same town,

with as great success in the last case as in the first.

Perhaps discussion will be useless, but it seems to be the only road toward a remedy, and that a long one.

Cement Mortar. Mr. Sabin's article, on another page, gives the results of some valuable and reliable experiments upon various mixtures of cement and sand for mortar and data for determining the cost of the various mixtures per cubic yard.

Mr. Sabin calls special attention to the fact that his experiments were upon dry sand weighing approximately 100 pounds a cubic foot and ⅜ voids, and that his results are exact only for similar sand. In any other case where strict accuracy is required the sand should be weighed, the voids determined, and proper corrections to the tables should be made. The principal reason for this caution is found in the fact that the experiments were made upon mixtures made in the various proportions by weight and the tables giving the proportions by volume were deduced from those by weight.

The tables and diagrams are given in convenient form, but many engineers will wish to make still another table giving the number of cubic yards of sand to be used for one barrel of cement and the number of cubic yards of mortar resulting. For practical work the barrel of cement is a more convenient measure than the cubic yard of resulting mortar.

Mr. Sabin states that damp sand weighs less than the same sand when dry, per cubic foot, but does not give any results of weighings to give an idea of the amount of reduction in weight. He speaks from exact knowledge, but a statement of details, and of the method of manipulation would be of interest. Water amounting to nearly three-eighths the volume of sand could be added to the dry sand, and will decrease its bulk. This would certainly make the sand damp, but if damp sand is dumped into the measuring box, in the same way as dry sand, a cubic foot of damp sand weighs less than one of dry sand. When saturation takes place the weight has again become greater.

Oil on Roads. Some slight experiments have been made by Mr. M. Meigs, an engineer in the employment of the United States government, on the use of oil to improve the condition of roads, the idea being developed by observation of leakage from a pipe-line on a road. The principle on which the value of the method must depend is that any ordinary material, when dry and mixed with even a small amount of cementing material, will carry any ordinary load. The oil acts as cementing material to prevent the formation of dust, and, if the surface of the road is properly formed to shed water, will keep the water

out of the road-bed, thus preventing the cutting of the surface and the formation of ruts in wet seasons, and removing the danger of freezing and consequent heaving and breaking of the surface. The experiments have not yet shown the lasting qualities of the oil and the expense of keeping the road in condition. Observation of roads in California treated with asphaltic maltha confirms these experiments, but the material is somewhat different.

LETTERS FOR THE PUBLIC.

Engineering Work in Detroit.

To the Editor of Municipal Engineering:

Sir: In the January number of Municipal Engineering is an article on "Duties and Compensations of Municipal Engineers," to which I would like to add a word, as Detroit is one of the cities in which the engineering work is divided among several departments. Engineers are employed by the various boards for the particular work of that board. Detroit pays to these engineers in charge the sum of $14,500, and to their assistants $27,750—a total of $42,250 for engineering work.

Were these various departments combined in one central office under a competent city engineer as general manager, a saving could be effected in the item of $27,750 by which the engineers in charge could receive better compensation without additional cost to the city and the city be the gainer thereby. There would be less "red tape" connected with the work and numerous evils now existing could be removed with a saving to the tax-payers. As one example our streets and avenues, as soon as paved, would not be immediately torn up for water mains and electric lines, as at present. Our engineering work is divided as follows:

City Engineer—Under board of public works, controlling paving and public sewers.

Water Engineer—Board of water commissioners, controlling the engineering work of the water system.

Electrical Engineer—Public lighting commission, controlling all electrical work.

Heating and Ventilating Engineers—Board of education, controlling the heating and ventilating of our public schools, subject to the approval of the board of health.

Sanitary Engineer—Board of health, sanitary problems under plumbing, house drainage and ventilation.

Park Engineer—Board of park commissioners, controlling all work in parks.

A. B. RAYMOND,
Sanitary Engineer, Detroit, Mich.

Responsibility for Mistakes in Bidding.

To the Editor of Municipal Engineering:

Sir—Kindly permit me to call your attention to the enclosed account of a litigation which has attracted much attention from municipal engineers during the past few years, and whose final decision by the U. S. Circuit Court of Appeals, a short time ago, is of the utmost importance to all who are concerned in the letting of public work. The paper has been carefully prepared at my request under the supervision of the able lawyer who ultimately succeeded in winning a bitterly contested case for the city, and it cannot fail to be of interest to your readers.

E. KUICHLING,
Chief Engineer, Rochester (N. Y.) Water Works.

A decision of vital interest to all municipal engineers in this country has just been rendered by the U. S. Circuit Court of Appeals in the case of the Moffett, Hodgkins & Clarke company against the city of Rochester, N. Y. The court here lays down the rule, enunciated for the first time by so high an authority, that for a mistake in the prices named in a proposal made in public competitive bidding, where there is no fraud or inequitable conduct on the other side, a bidder cannot be relieved from his proposal.

In the case referred to, the company mentioned submitted on Dec. 25, 1892, a proposal in much detail, aggregating the sum of $357,552.50, for the construction of a riveted steel pipe conduit, nearly thirty miles in length, of which only about 1.5 miles was to be in tunnel, while the remainder was in open trenches. This proposition was accompanied by a bond in the penal sum of $90,000,

conditioned that if said proposal was accepted by the executive board of said city, the bidders would perform the work referred to and would enter into contract with the city for said work, the blank form of such contract being attached to the bid.

After all the bids had been opened and canvassed, the company claimed that it had made mistakes in its proposal amounting to $63,800. The alleged mistakes consisted in bidding 50 cents, instead of 70 cents, per cubic yard for earth excavated in open trenches, and $1.50, instead of $15, per cubic yard for earth excavation in tunnel. The company also submitted a written statement to the board of authorities of the city having charge of letting the work, setting forth the alleged mistakes and asking to be allowed to withdraw its proposal. This the city authorities refused to do, and served a notice upon the company requiring it to execute the proposed contract within a certain time, or suffer a default on the bond mentioned. The next lowest bid was $272,642.50 higher than that of said company.

Instead of executing the contract, the company commenced an action in the United States court, praying that such contract be reformed according to its corrected prices, or that it be entirely rescinded. In this action it was contended by the company that the city authorities acted in bad faith in awarding the contract to it after their attention had been called to the alleged mistakes, and it was upon this theory that they applied to the court for relief. The case was prepared for argument by the Hon. Adolph J. Rodenbeck, then corporation counsel of the city, who insisted from the beginning that if the contention of the company prevailed there would be no security in public bidding, and that any bidder could easily be relieved from an unfavorable bid.

After many vexatious delays the case was argued before Justice Alfred C. Coxe, of the United States Circuit Court for the Northern district of New York, who filed his decision on August 18, 1897, sustaining the contention of the company and decreeing that the proposal be rescinded and the city enjoined from prosecuting the bond. From this decision an appeal was taken by the city to the United States Circuit Court of Appeals, and that court has just reversed the decision of Justice Coxe and sustained the contention made by the corporation counsel.

It was contended by Mr. Rodenbeck that there were certain features in the case which distinguished it from all other cases cited by the opposing counsel. The attention of the court was called to the fact that the statute under which the work was advertised required competition in bidding. Under the charter of the city the municipal authorities were directed to cause a notice to be published for at least ten days before the letting, asking for sealed proposals, each to be accompanied by a proposal bond, and said authorities were also bound to let the work for the best interests of the taxpayers. (Laws 1890, chapter 576, sec. 28). The statute furthermore provided that neither the principal nor the sureties on any bid or bond should have the right to withdraw or cancel the same until the contract for which the bid was made should have been let and the same should have been duly executed. In addition to these provisions the notice for bids provided that no bid could be withdrawn after having been duly delivered. It was therefore contended on behalf of the city that when the bid was presented it became final; and under this head the cases of the East River Gaslight company vs. Donnelly (93 N. Y., p. 557) and Kimball vs. Hewitt, as mayor, etc. (17 N. Y., State Reporter, p. 744) were cited.

The corporation counsel further insisted that there was no fraud or inequitable conduct on the part of the city authorities, and that the case was to be distinguished from those cases where relief had been granted for mistake on one side and fraud or like conduct on the other. It was urged under this view of the case that every presumption was in favor of the good faith of the city authorities in awarding the contract, and that, as Judge Folger said in the case of Mandeville vs. Reynolds (68 N. Y., p. 534), there was a presumption of law "that no official person acting under oath of office will do aught which it is against his official duty to do, or will omit to do aught which his official duty requires should be done." Further authorities under this head were cited as follows: Throop on Public Officers, sec. 558; Mechem on Public Officers, sec. 597; Reilly vs. Mayor, etc. (111 N. Y., p. 437;) Dickinson vs. city of Poughkeepsie (75 N. Y., p. 69). With these Mr. Rodenbeck clearly distinguished the case at bar from several cases cited by the opposing counsel, pointing out the difference between this case and that of Smith vs. Mackin (4 Lansing, p. 41), where there was a mistake on one side and fraud on the other; also its difference from the case of Rider vs. Powell (28 N. Y., p. 310), in which the judgment was distinctly put upon the ground of a finding of fraud. He also distinguished the cases of Webster vs. Cecil (30 Beav., p. 62), Garrard vs. Frankel (30 Beav., p. 445) and other similar cases

where there had been prior negotiations between the parties, and the offeree knew that a mistake had been made.

A further contention of Mr. Rodenbeck was that, since no mutual mistake of the parties had occurred or was charged, the case was readily distinguishable from those cases where relief had been granted under such circumstances, and also from many cases cited by the opposing counsel, such as Crowe vs. Lewin, (95 N. Y. p. 423), in which Judge Finch said there was a mutual mistake, or if not that, then fraud; also the cases of Hartford & New Haven R. R. Co. vs. Jackson, (24 Conn. p. 514), and Rowland vs. N. Y., N. H. & H. R. R. Co., (61 Conn. p. 103). In the former of these cases, the agent of the railroad company made a mistake in thinking that the price for 100 bundles instead of 500 bundles was asked, and the defendant erred in assuming that the price given by the agent was the price for 500 bundles, whereas in fact it was the price for 100. In the other case the agent of the railroad company supposed that he was asked the rate to Milford, which he gave, and the plaintiff supposed that the agent gave him the rate to Bradford. The cited case of Ripley vs. Daggett,(74 Ill. p. 351), was plainly a case of mutual mistake; and the same is true in the cases of Kyle vs. Kavanagh, (103 Mass. p. 356); Bloomer vs. Spittle, (L. R. 13 Eq. p. 427); Elliott vs. Sackett, (108 U. S. p. 132); Griswold vs. Hazard, (141 U. S. p. 283).

The corporation counsel further charged that the said company either consciously and purposely submitted an unbalanced bid, or was guilty of negligence in bidding; and in his brief he discussed fully both of these aspects of the case. He contended that the negligence of the bidder in preparing and submitting its bid, distinguished the case from those cases cited by his opponents, where a scrivener failed to reduce to writing the agreement actually made; such as the cases of Drury vs. Hayden, (111 U. S. p. 223); Wheeler vs. Kirtland, (23 N. J. Ep. p. 13); Menomonee Locomotive Mfg. Co. vs. Langworthy, (18 Wis. p. 444). In support of his contention under this head, the following authorities were cited: Rapalje & Lawrence Dict., p. 827; Penny vs.. Martin, (4 John Ch. p. 567); Canal Bank vs. Bank of Albany, (1 Hill, p. 287); Pomeroy, Eq. Jurisprudence, sec. 839; Beach, Modern Eq. Jurisprudence, sec 54; Capehart vs. Mhoon, (5 Jones Eq. N. C. p. 178); Kearney vs. Sascer, (37 Md. p. 276); Glenn & Price vs. Statler, (42 Iowa p. 107); Toops vs. Snyder, (70 Ind. p. 560); Conner vs. Welch, (51 Wis.p. 431); Grymes vs. Sanders, (93 U. S. p. 58); Moran vs. McLarty, (75 N. Y. p. 28); Brown vs. Fagan, (71 Mo. p. 563).

The corporation counsel also went a step further, and contended that even if the case under consideration was one of unilateral mistake, without fraud or inequitable conduct on the part of the city authorities, the proposal could not be rescinded or reformed. Under this proposition numerous authorities cited by the lower court were distinguished, and the following authorities cited in substantiation of the proposition: Dambmann vs. Schulting, (76 N. Y. p. 55); Chitty, Contracts, p. 1022; Addison, Contracts, sec. 1182; Story, Eq. Jurisprudence, sec. 151; Diman vs. Prov. W. & B. R. R. Co., (5 R. I. p. 130); McCobb vs. Richardson, (24 Me. p. 82); Taylor vs. Fleet, (4 Barb. p. 95); Wood vs. Patterson, (4 Md. Ch. p. 335); Deeves vs. Richardson & Boynton Co., (39 N. Y. S.. Rep. p. 175); Langley vs. Harmon, (97 Mich. p. 353); Reilly vs. Mayor, etc., of New York, (111 N. Y. p. 473).

In concluding this part of his brief the corporation counsel said: "The diligence of appellee's counsel has not brought to light any case in the history of jurisprudence where relief has been granted, where the facts bear any resemblance to the facts in the case at bar, where public officers and public statutes are concerned; nor has he cited to the court a single case where recission has been granted for mistake on one side without fraud or like inequitable conduct on the other. All of his cases are readily distinguishable from the case at bar as cases where public officers and public statutes were not concerned, or cases of mutual mistake, or mistake on one side and fraud or like inequitable conduct on the other."

In writing the opinion of the appellate court Judge Wallace reviews the case at length and the various authorities cited by counsel on both sides. After such an examination he says: "A very extended examination of the reports has failed to disclose a case in which a judgment rescinding a contract has proceeded solely upon the ground that the terms, as reduced to writing, although expressing the understanding of one party, did not express that of the other. In all the reported cases where there was not the element of mutual mistake, or mistake on one side with knowledge on the other, there was, in the language of Addison, 'some undue influence, misrepresentation, surprise or abuse of confidence,' or the contract was so oppressive as to be unconscionable. * * * The salutary power of

courts of equity to rescind or reform contracts which do not express the real intention of the parties is not to be extended to cases where the contract, because of the mistake of one of the parties, fails only to express the meaning of that party, and he seeks relief purely on the ground of his own mistake. * * *

"A court of equity cannot undertake to make a contract for parties which they have not made themselves, and would equally transcend its just powers by compelling a party to relinquish the fruits of a contract which he had honestly made and in which there is no taint of wrong to affect his conscience. The rescission or cancellation of a contract is certainly as drastic an interference with its provisions as a modification of it. The consequences may be equally or even more injurious to the party which is deprived of the benefits to which he is entitled by it, and there is no sound reason, and, as we think, no well considered authority for the proposition that a court of equity will not reform a contract except for the mistakes of both parties, but will rescind it merely for the mistake of one party."

Street Railway Franchises.

To the Editor of Municipal Engineering:

Sir—The street railway franchise situation in Chicago certainly compels attention from every thoughtful citizen. The solicitations of the representatives of the street railways on the one side and the opposition of the city council on the other, only suggest inquiry as to the real cause for the bitter contention which may be found in the spirit of the time touching municipal franchises. It is a demand of the public for rehabiliation in and possession of those public functions which are inherently the property of the people. The spirit of municipal ownership is the high wave on the crest of which we observe these contentions: the actors in which are dwarfed by the dignity and proportion of the pedestal on which they perform. Nor does municipal ownership mean that there is danger to the interests of these corporations. The cost of great reforms will always be borne cheerfully by an honest public in well-policed communities. The promise of municipal ownership of street railways at some remote period does not inspire the people with entire confidence in that desired consummation. The great question is now very decidedly before the people and now there is the opportunity to settle it for all time. Why not make the negotiation on the basis of immediate ownership by the city of all the tracks, franchises and property of all the street car lines, the city to give to the present owners leases that shall be a liberal compensation for the transfer of such properties. On careful examination the officers of the street railway companies will find that there is not so great a difference to them between "ownership" and "occupation" as at first thought might appear. By such a negotiation patiently and wisely conducted by representatives of the city and of the street railway companies an agreement could be reached that would cause great rejoicing among the people and that would enhance and not decrease the market value of the stocks and bonds of the street railway lines. Chicago has been much slandered of late. If her representatives can adjust these differences so that in a day she becomes the absolute owner of one thousand miles of street railway and in the adjustment does no harm to anv interest and satisfies every demand of commercial honor, making the investment of the stockholders of the street railways better than it is now, then perhaps Chicago may become justly famed for her solution of this vital question and give to the world as a model "the Chicago plan." State legislation would be necessary to make such a negotiation but this could easily be had by the co-operation and consent of all parties.

VOLNEY W. FOSTER.

Percentage Bidding Successfully Demonstrated.

To the Editor of Municipal Engineering:

Sir—On page 376 of your magazine for December, 1898, you refer to remarks made by me before the American Society of Municipal Improvements on the subject of unbalanced bids and give what purports to be an example of the working of a new method of prevention. The system as adopted in this city and used for more than a year differs materially from that published and has been productive of such good results that I will mail you herewith a clear and concise statement of its workings. I believe that an investigation of its merits will warrant its general adoption by engineers and municipalities. Very respectfully yours,

GEO. T. BOUTON.

Jersey City, Jan. 16, 1899.

Mr. Bouton's statement of the method devised by him and successfully tried in Jersey City is as follows:

The general custom heretofore has been for the engineer to prepare an estimate of the quantities required, which were then advertised, and on the basis of which bids were submitted by contractors, for instance:

About 100 cubic yards of earth excavation, per cubic yard..... ....
About 15 cubic yards of rock excavation, per cubic yard..... ....
About 115 cubic yards of earth filling, per cubic yard..... ....

And so on ad libitum. The contractor would put a price against each item, such price representing what he expected to be paid per yard for each yard found in the process of doing the work. He oftentimes made it a gamble, and where a low estimate had been made by the engineer the contractor would put a price largely excessive, this being followed by a price ridiculously low on some other items, so that the average of bid was maintained. While this resulted many times in the contractor getting his fingers burned, there were more than a few cases in which the engineer's estimate was largely exceeded and immense profits made. When the contractor got the worst of it he generally endeavored to excite the sympathies of the executive officers and secure an allowance for extra work of some kind.

When the city got the worst of it the contractor could laugh in his sleeve, but the people along the line of the improvement and against whom an assessment was levied, would be up in arms. It was a most unsatisfactory arrangement all around and a cure seemed almost impossible of accomplishment, but we have finally succeeded in adopting what seems to be a specific.

Our present plan requires that the engineer shall submit with his estimate of quantities a price for each item based on current rates and existing conditions. These prices we designate the hundred per cent. standard, and they are advertised with the estimate. The contractor is required to state at what percentage of the hundred per cent. standard he will do the work. He may want more than one hundred per cent. estimated by the engineer, he may be willing to do the work for less, but what per cent. he quotes applies to every item named in the estimate and it matters not to the city whether in the actual doing of the work the estimate overruns or underruns, no more than a fair price can be paid.

In lieu of freeholder security contractors are now required to furnish the bond of some surety company authorized to do business in the state of New Jersey. We consider this a safer and better plan for the city in that there is no question as to the soundness of the bond. It is now practically impossible for a bidder to refuse to sign a contract which has been awarded him unless he is prepared to meet the financial penalty attendant thereon.

Redwood Block Pavement at Oakland, Cal.

To the Editor of Municipal Enginering:

Sir—The articles on wood block pavements which appeared in the September number of Municipal Engineering were of great interest to me, and possibly a description, prepared for my fourthcoming annual report, of a wood block pavement recently constructed in this city, which I send herewith enclosed, might also be of interest to your readers. M. K. MILLER, C. E.,

Superintendent of Streets, Oakland, Cal.

Wood blocks have been used extensively in the United States for many years for street paving, but without that degree of success which has characterized other kinds of pavements. The comparative failure of the wood block pavement has been due, however, for the most part, to poor design and careless construction. Within recent years a radical change in the construction of wood block pavements has developed. The necessity of selecting good material for the blocks and of giving them antiseptic treatment to prevent decay and of placing the blocks upon a substantial concrete foundation, as is done with all other modern pavements, is clearly recognized by municipal engineers, and samples of the block pavement recently constructed in California give promise of meeting all expectations.

The redwood block pavement laid upon E. Twelfth-st. is considered upon the Pacific coast at this time a modern wood block pavement.

Only time itself can prove the wisdom of selecting redwood blocks in preference to bituminous rock or asphalt. The wearing qualities of this wood block pavement in San Francisco as compared with other pavements had proven itself to be more than their equal. Two and one-half inches of the best quality of bituminous rock was completely worn out twice in one year on East-st. adjacent to Market-st. in San Francisco under the immensely heavy traffic thereon. There is probably no street in San Francisco that affords a more severe test for street pavements than at this point.

Wood blocks were finally substituted for bituminous rock and they have now been down three years and without any expense whatever for maintenance. The pavement is now in a comparatively good condition, although showing some signs of wear and a few individual blocks should be immediately removed. The lasting quality of the wood itself is a feature which is more or less uncertain. The experience with all wood block pavements throughout the world has

been that individual blocks decay, and in many cases without any apparent reason, much faster than the body of the pavement. A lack of uniformity in the fiber of the wood is the cause usually of individual blocks giving way and causing the pavement to wear rough and irregular. This feature of the wood block pavement in general will be largely mitigated in this particular case by the carpet of asphalt with which the blocks are covered and which it is intended should sustain the greatest amount of wear. The blocks themselves in this pavement are not intended to sustain any wear; the fiber of the wood is protected by the asphalt covering and it is known from experience that this carpet will sustain such traffic as we have on E. Twelth-st. for a period of at least two years; a portion of the pavement will doubtless have to be recarpeted every two or three years, possibly more often where the line of wagon traffic is concentrated. This pavement presents a smooth, noiseless and sanitary surface and affords a splendid foothold for horses.

The pavement consists of red wood blocks 4 inches by 6 inches square, laid snug block to block, upon a 6-inch concrete foundation, the surface of which, before the blocks are laid, is painted with a thin coat of hot asphalt. Before laying, the blocks are treated by boiling in an asphaltic bath, and after laid upon the foundation, the spaces between the blocks are entirely filled with boiling asphalt cement, applied i n sufficient quantity to cover the surface of the blocks about 1-16 of an inch in depth. The blocks were laid close together in even rows, at right angles to the curb, with joints broken not less than one inch. The lumber of which the blocks were composed was what is ordinarily termed seasoned, but cut redwood. Many of them were heavy with the natural wood acids. The blocks ranged in weight from two to six pounds. The variation in the blocks has caused some uneasiness, but after extended inquiry and investigation before the work was commenced it was decided that the quality or stability of the pavement would not be impaired by ignoring this feature. The tanic acid contained in the wood is preservative, and is considered by experienced lumbermen to be desirable, rather than objectionable.

During the early part of the work observations were made as regards many of the details connected therewith. It was soon observed that the blocks, when delivered upon the ground, and exposed to the weather, sun checked very rapidly. This is particularly true, naturally, of the dryer blocks. Just what ultimate effect the sun checks will have on the pavement is problematical. It was supposed that the checks would be thoroughly filled and sealed with asphalt by the dipping process, but experience proved this not to be the case. Sun checked blocks, after treatment, when submerged in water, were found to take in a comparatively large amount of fluid. The boiling asphalt would run into the checks, but evidently ran out again, for they were found not to be filled and sealed. The asphalt mixture, in which the blocks were to be dipped was a matter for serious consideration. The specifications provided that the mixture should be 50 per cent. hard asphalt mixed with 50 per cent California liquid asphalt. The blocks came out of this mixture in an unsatisfactory condition. They were sticky and glazed on the ends, and the asphalt did not penetrate into the fibre of the wood more than 1-16 of an inch, whereas more than ¼ of an inch penetration was desired. The bath was changed to 80 per cent of hard asphalt and 20 per cent. of the liquid flux, with more satisfactory results. This mixture is considered much superior to the former, inasmuch as the hard asphalt is refined and contains the more permanent oils. The temperature of the bath was found also to be a matter of importance. When allowed to get below 350 degrees Fahr. some of the blocks would come out unsatisfactorily, sticky and glazed on the ends, and with little penetration of the asphalt into the fibre of the wood. A temperature from 350 to 400 degrees Fahr. should be maintained while the blocks are being dipped. The time of submersion in the bath is not so important a matter as might be expected. If sufficiently hot, say at a temperature of 375 degrees, three to five minutes' submersion appears to give as much penetration as fifteen minutes. The blocks in this pavement were submerged not less than six, nor more than ten minutes. Experiments were made by submerging the blocks in the bath at five, ten, fifteen and thirty-minute, one hour, six-hour and ten-hour intervals.

The dry blocks, if submerged longer than fifteen minutes, are considerably checked by the force of the heat. When left in the bath several hours they come out badly split and unfit for use. Blocks submerged but five minutes, when split open, are found to be too hot throughout on the inside to handle comfortably with bare hands. The effect of the heat is ,of course, to dispel the moisture in the blocks; and in some cases the blocks when removed from the bath, although having absorbed about three ounces of the asphalt, actually weigh less than before being treated.

As previously stated, blocks dipped in a bath of too low a temperature would come out sticky and glazed on the ends and with but little penetration into the fibre of the wood; had the penetration been sufficient the glaze on the ends would not have been objectionable; on the contrary, it would have insured the blocks being impervious to water. It was found that the treated blocks after having been laid on the concrete foundation would check by the force of the sun heat even more readily than before being treated. To prevent this the first course of grouting material should be applied to the pavement within a few hours after the blocks have been laid. Before laying the blocks the concrete foundation is given a thin coating of liquid asphalt applied at a boiling temperature. The practical utility of this coat of asphalt is uncertain; it of course does no harm, but it is somewhat doubtful if the benefits justify the additional expense. One of the essential points to be observed in this pavement is to preserve the blocks from the absorption of moisture, and the idea of coating the concrete foundation with asphalt was to seal the concrete and thereby prevent any moisture from getting into the blocks from that source. Considering, however, that the blocks themselves are supposed to be impervious to water after treatment and that the spaces between the blocks are all thoroughly filled with asphalt cement, beside a wearing coat of asphalt cement and sand on the surface of the blocks, it appears quite impossible for water to get in under them. The grouting material was composed of 80 per cent. hard asphalt, 20 per cent. liquid asphalt, to which was added 30 per cent. of carbonate of lime. The carbonate of lime was first mixed with 15 per cent. of liquid asphalt. The moisture contained in the carbonate of lime when applied direct to the asphalt mixture caused it to boil over the side of the kettle, and it was therefore found necessary to mix it separately with half the desired quantity of liquid asphalt. There appears to be a natural affinity between asphalt (anhydro carbon) and carbonate of lime. The effect of mixing carbonate of lime with lime is to render the latter material tough and rubbery. As much as 50 per cent. of the carbonate of lime can be mixed with an equal proportion of asphalt, and when heated to boiling temperature the fluid will run like water.

It was found necessary to apply the grouting material in not less than three courses; spaces between the blocks which appeared to be thoroughly filled immediately after the first coating was applied in the course of two or three hours were found to be partially empty, the grout having settled down into the open space. The second coat also failed to thoroughly fill the crevices and in some instances even the third coat, after the final settlement of the grout, left some of the spaces not entirely filled. If the first coat was poured on too freely it would tend to float an occasional block and considerable trouble was experienced on this account. If the grout once starts in under a block it will gradually lift it and in course of a few days will displace it as much as one inch vertically.

The grouting material when cold glues the blocks together with a tensible strength of over 200 pounds per square inch; on a hot day it softens considerably, however. After the final course of grout has been applied the pavement is covered with a coat of hot sand about a quarter of an inch in thickness; this sand is gradually taken up by the asphalt, which thus becomes hard and firm, leaving the blocks carpeted with about an eighth of an inch of what is really bituminous rock. This carpet is the wearing surface of the pavement and experience has shown, as previously stated, that it will sustain ordinary wagon traffic on a city street for at least two or three years. It can be renewed at an expense of less than half a cent per square foot, and it is very essential that it should be renewed as often as necessary, particularly where the blocks are of redwood. Where hard wood is used it would not be so successful, but redwood is soft and would speedily give way under the forces of impact and abrasion when once the fibre of the wood is exposed.

In the construction of this pavement no space was left at the curbs for any expansion of the blocks; in fact, no appreciable expansion is anticipated. The blocks are supposed to be impervious to water under ordinary conditions, incident to rainfall. The carpet of asphalt which protects the fiber of the wood from wear is intended to be maintained by renewing it as often as necessary. If not maintained, wagon traffic will, of course, eventually cut into the blocks, which will then absorb the moisture and expand more or less. If the pavement fails, however, on this account, it will be due entirely to the negligence of the authorities, and cannot be charged to any fault in the design of the pavement. Experience with this pavement in San Francisco has demonstrated that the blocks, after the asphalt carpet is worn off, will stand an immense amount of traffic. The asphalt absorbed by

the blocks glues together the fibers of wood, rendering it tough, and infinitely more durable than untreated blocks.

During construction every block passed through the hands of a reliable inspector before it was subjected to the asphaltic bath. About 10 per cent. of the blocks delivered upon the work for use by the contractor were condemned. Personal attention was given to the work throughout from beginning to end and it can be confidently asserted that if there is any merit in the redwood block pavement over and above other pavements the people of Oakland will get the benefit thereof in this case.

Electricity Eating Up Water Pipes.

To the Editor of Municipal Engineering:

Sir: The position taken by your excellent magazine that the escaping electric currents are almost everywhere damaging the water pipes of cities is again confirmed by the report of the electrical expert, Mr. A. A. Knudson, just made to Jersey City, N. J. The following outline of his report from the New York Sun will interest the owners of water works, whether they be municipal or private. ENGINEER.

New York, Jan. 26, 1899.

The article from the New York Sun referred to in the foregoing communication is as follows: A. A. Knudson, an electrical engineer of this city, who was engaged by the Jersey City authorities to ascertain whether the water mains across the meadows were being damaged by electrolysis, submitted his report yesterday. He made a special investigation of the mains in Belleville avenue, through which the Union Traction Company's trolley line runs, and found that they and the mains across the Hackensack meadows are being damaged by the electricity which escapes from the traction company's tracks. Mr. Knudson says the railway people appear to be anxious to discover and stop the leakage for their own interests as well as for the city's.

"The most effectual method of eliminating this current escape to your mains," he reports, "would be a removal of the rails from the portion of the street in which the mains are located. As this, however, may be impracticable, I would suggest that the company be allowed to make such changes to reduce the escape that they have in mind, such as putting in more tap connections from their return wire to their rail (they now being over 1,000 feet apart) and examining and renewing such rail bonds as well as cross bonds as may be found imperfect. Should future tests indicate a condition still dangerous to your mains we shall be ready to suggest, if desired, additional methods of correcting the trouble.

"In conclusion permit me to say that the action of your honorable board in having investigation made is most commendable, as in all probability the dangerous secret agent found actively at work at the source of a great city's water supply would not have been discovered until after some accident had occurred, such as the bursting of a main caused by the weakening of the iron by this process of electrolysis."

Chief Engineer Van Keuren of the Street and Water Department agreed with the expert's views, and action will be taken as soon as possible to remedy the trouble.

LEGAL DECISIONS AFFEC ' G MUNICIPALITIES.

[Reported Specially for MUNICIPAL ENGINEERING.]

Property Rights of Water Companies—An ordinance wrongfully reducing water rates, where the constitution and laws of the state apparently pronounce severe pains and penalties upon collections of higher rates than those prescribed by ordinance, so affects the property rights of the water company and hinders it in the collection of its lawful revenue and compensation, that a court of equity will afford protection against such an ordinance, even though the city is taking no active steps to enforce it. Los Angeles City Water Co. vs. Los Angeles (U. S. Cir. Ct.) 88 Fed. Rep. 720.

Ownership of Buildings When Municipality Is Divided—On a division of a municipality, in the absence of legislative regulation, each portion will hold in severalty—to its separate use, etc.—for public purposes the public property which falls within its limits. Prescott vs. Town of Lenox (Tenn.) 47 S. W. Rep. 181.

Powers of Municipalities—Municipal corporations possess these powers, and no others: (1) Those granted in express words; (2) those necessarily and fairly implied in, or incident to, the powers expressly granted; (3) those essential to the declared objects and purposes of the corporation—not simply convenient, but indispensable. Any fair, reasonable doubt, concerning the existence of the power is resolved against the

corporation by the courts. Los Angeles City Water Co. vs. Los Angeles (U. S. Cir. Ct.) 88 Fed. Rep. 721.

Silent Partners in Public Contracts—The fact that one of the parties to a contract for municipal works made it for the benefit of an undisclosed third person does not affect its validity. Herman vs. City of Oconto (Wis.), 76 N. W. Rep. 365.

When Money Is Used to Influence Public Contracts—A contract with a municipality, obtained by bribing the public officials, whose action is essential to its making, is void, even when the approval of the city council is required to make it binding. Herman vs. City of Oconto (Wis.), 76 N. W. Rep. 364. The payment of money by a public contractor to influence men to remain silent or to lobby on behalf of contracts or estimates is against public policy, and the courts will not compel contribution between partners on an accounting between them, nor will they, when one partner is chargeable with the receipts, allow him credit for money so paid. McDonald vs. Buckstaff (Nebr.), 76 N. W. Rep. 476.

Municipal Contracts and the Courts—Questions touching the necessity for public improvements placed upon the streets, and the nature and terms of the contract entered into by the city with the contractors who undertake the work, are within the sound discretion of the municipal authorities, and their action will not be controlled by the courts unless such discretion is manifestly abused. Bacon vs. Savannah (Ga.), 31 S. E. Rep. 127.

City Charters and Water Works—Charter authority "to provide for supplying the city with water" gives the city power to contract with a water company in respect to rates to be charged consumers. Even if the power of a city to regulate water rights is legislative and governmental and not a special legislative grant for private purposes the city may still, by contract, abridge such power, under an implied or express legislative grant. Los Angeles City Water Co. vs. Los Angeles (U. S. Cir. Ct.), 88 Fed. Rep. 722.

Liability of Cities for Defective Sidewalks—To make a city liable for injuries resulting from a defective sidewalk it must appear either that the city had notice of the defect, or that it was a patent defect, and had continued so long that notice might be reasonably inferred, or that the defect was one which, with reasonable and proper care, should have been ascertained and remedied. Pleasanton vs. Rhine (Kan.), 54 Pac. Rep. 512.

Damages by Reason of Improvements of Streets—A municipal corporation engaged in the authorized improvement of its streets is liable to adjacent land-owners for diverting surface water from its natural channels, and negligently providing inadequate and improperly constructed sewers to carry away the water thus diverted. New Albany vs. Lines (Ind.), 51 N. E. Rep. 346.

CURRENT INFORMATION.

English Experiments in the Treatment of Sewage.

A report compiled by the Lord Mayor and T. Hewson, city engineer of Leeds, gives the details of the experiments carried out in sewage disposal under the direction of W. J. Dibdin. When the committee called him, in July, 1897, to advise it, he undertook to make some laboratory experiments on small coke filters with samples of average Leeds sewage, and with samples of specific trade effluents from tanneries and the iron liquor from chemical works. In dealing with the iron liquor by itself, he found that there was at first a considerable oxidation of the iron salts. This result was obtained, however, at the expense of the efficiency of the beds, which soon became unfit for further work. Good results were obtained on the small experimental beds with samples of average Leeds sewage, containing iron liquor, tan refuse and other trade effluents, giving 80 per cent. of purification as the measure of the work of the double beds. In tan liquors alone, undiluted by sewage, it was found that the effect of this double treatment, first on a coarse and then on a fine bed, gave nearly 80 per cent. purification and removed the solids in suspension. The committee, encouraged by this report, decided to proceed to a practical experiment on bacterial treatment at the Knostrop works. A coarse bed and a fine bed were constructed, each of about one-eighth of an acre. The coarse bed was filled with coarse coke not less than 3 inches diameter, and the fine bed with coke not less than 3-16-in. diameter and not more than 1½-in. diameter. The floors of the bed are paved with old bricks grouted with cement, and are formed with a fall to the outlet ends of the beds. Upon them are laid 3-inch agricul-

tural tile drains, 2 feet apart, connected at their low ends with a brick collecting drain, which conveys the drainage to outlet valves. On October 2 the first sewage was turned on to the beds. Absolutely crude sewage was used and the beds were worked in this way for four months. The amount of purification shown by the final effluent after the beds had become established is considered satisfactory and proves that, notwithstanding iron liquor and other trade effluents mixed with the sewage of Leeds, it can be treated on bacteria beds so as to produce a really good effluent. The effluents from the fine bed had no smell, except at times a slightly earthy odor. The first flow was always cloudy, and in some cases turbid, but it cleared more or less according to the varieties of sewage being treated. The latter part of the flow was always clear. Some carp were put into the effluent basin in order to make a physiological test of the effluent, more than half of which died within a month, but this was apparently due to the rush of the effluent carrying them against the outflow grating. Provision was then made to protect the fish from the full pressure of the rush, and the three carp that were living at the time this was done are still alive, having been continuously in the effluents, good and bad, which have passed through the basin for a year.

The gross capacity of the rough bed is 174,800 gallons, and the wet or liquid capacity, after filling in the coke, is estimated to be 83,300 gallons. When the beds were considered to be in good working order a careful measure of capacity was made, which showed that the rough bed had been reduced to 63,400 gallons. An analysis of a large number of samples of crude sewage taken daily for two and a half months indicates that the average amount of matter in suspension in the crude sewage of Leeds is 37.2 grains per gallon. The analysis of the effluent from the rough bed during the same period gave 11.9 grains per gallon as the amount of solids in suspension. Hence, the amount kept back by the rough bed was 25.3 grains per gallon. Chemical changes set up by allowing the beds to remain empty for a fortnight were found beneficial, and the experiment points to the feasibility of treating the crude sewage and consuming the sludge if periods of rest are provided about two weeks out of five in winter, and one week in four in summer. Experiments with screened sewage were carried on for six months, from March 4 to September 8, with seven days' rest; from April 27 to May 4, and an enforced rest of 38 days, from June 16 to July 25. The number of fillings during the whole period was 315; the average of the fillings was 46,000 gallons and the total passed over the bed during the six months was 14,490,000 gallons; after making allowances for the solids screened off it is estimated that about 51,000 gallons of sludge were retained by the rough bed. The capacity on March 2 was 52,100 gallons and on September 8, 41,000 gallons; net loss of capacity, 11,100 gallons. Deducting this from the estimated amount of 51,100 gallons retained by the rough bed there remained 40,000, or about 80 per cent., as the amount of sludge consumed in this period by the rough bed. The fine bed retained 16,700 gallons of sludge, the whole of which was consumed, the capacity of the bed not having been decreased. The effluent from the find bed during the six months, except for the first fortnight after the long rest, continued satisfactory.

Garbage Disposal for Towns.

The method of garbage disposal in Newport, Ky., has been the cause of several prosecutions during the last three or four years. Last fall the city was fined in the circuit court for permitting and maintaining a nuisance. The present contract for the removal of garbage expires May 1, 1899, and it was necessary to make appropriations and other provisions for removal before Jan. 1, 1899.

In a recent report to the council relative to the subject of collecting and disposing of garbage and other waste material, W. L. Glazier, city engineer, stated that three methods are principally in use—cremation, disinfection and reduction by various processes. He recommends garbage disposal by cremation as the one best suited to the needs of a city the size of Newport on account of its cheapness, simplicity, ease of operation, and its capacity for being made a sanitary system. He believes that the cost of installation and the expense of operating the other two methods would be an objection, while their complication would render them more or less inoperative, because of the expense of obtaining skilled labor to properly run them. Mr. Glazier explains that a crematory does not have to be built at a great distance from residence property, but can be operated with no more injury or inconvenience than an ordinary manufacturing establishmet. Thus the collection and hauling of garbage to the plant is kept at a minimum cost. In suggesting a location for such a plant, which is on a street practically given up to manufacturing purposes, Mr. Glazier does not forget the possible annexation at some future time of Bellevue and Dayton to Newport, and he

advises building the plant with this idea in view. He also suggests that if the cities of Bellevue and Dayton should, as separate municipalities, burn their garbage in conjunction with Newport, a proper proportion could be made which would reduce the expense of operating to that city. Some of the points made by Mr. Glazier, in the information obtained, are as follows: A plant should be designed to have a furnace capacity necessary to provide for present needs, with building space to enlarge at any time that it may become necessary. Not over 20 or 25 tons daily are collected. Some burn without the use of other fuel than the garbage and refuse, and some use coal or coke. The cost varies from 15 cents to 45 or 50 cents per ton, according to local conditions, care with which plant is operated, cost of fuel, etc. Covered metal receptacles should be used to store garbage in, as much of the nuisance and disease caused by garbage occurs from decomposition in the receptacles on the premises. Mr. Glazier believes that a plant suitable to the needs of Newport can be erected at a cost of $5,000 to $7,000, exclusive of cost of land, royalties, etc.

State Aid in Road Building in New Jersey.

The advance proof sheets of State Road Commissioner Budd's annual report, prepared for submission to the New Jersey legislature, reviews the work done in road-building under the state aid law during the last year. During the last year 85 miles of roads were built under the state aid law, nearly all of which were stone. The total mileage of roads constructed in the several counties under the state aid law since its passage in 1893 is 325 miles and the amount of state aid is $565,826.05. Petitions have been filed for 426 miles of roads, and it is estimated that it will cost $1,472,429.12 to build them, of which the state's share would be $500,000. Under the annual appropriation of $100,000 it would be five years before all these roads could be built. This leads Mr. Budd to suggest that the annual appropriation be increased to $300,000. If extra appropriation is not made, Mr. Budd advises that state aid should be limited to those counties that have already done much stone road building, as it will permit the completion of a system of roads that lead from the large centers. The improvements and the lessening of cost in stone road building is discussed by Mr. Budd, who says: "The ability to construct a greater number of miles each year arises from a better understanding on the part of the states and counties of the principles of road building." In the past it was the rule to first lay an expensive foundation of large streets, so that the greater part of the cost of the roads was in the foundation. But observation and experience have demonstrated that the earth properly drained is as good a foundation as can be obtained for any road superstructure, and, until the roads have to be resurfaced, it is not necessary to deposit any more thickness of metal upon the surface than is required to stand up under the wear. After the roads are subjected to two or three inches of wear it seems necessary, in order to preserve a proper surface, to recoat the street; so that all that is needed to maintain the integrity of the road is to have a sufficient foundation to sustain these two or three inches. Therefore, the principal construction of the state has been resolved into roads, four, six and eight inches deep. The cost of constructing roads has been reduced to an average of $4,000 a mile. This saving is effected by covering the road with an application of coarse sand or gravel. Mr. Budd says the system of changing engineers on account of politics is a bad one, as it results in expensive experiments. There are eight counties that retain their engineers regardless of politics.

An Illegal Contract Between a Village and Water Works Company.

The Supreme Court of Nebraska rendered a decision recently in a suit based on an ordinance adopted by the board of trustees of Grant about ten years ago, authorizing the Lincoln Land company to construct and maintain a water works system in the village, and to use the streets for a term of 25 years for its mains. The ordinance provided, also, that the company should furnish the village the use of 15 hydrants free of cost for 4½ years immediately following the completion of the system, and that for 20½ years next ensuing the village should pay the company an annual rental of $60 a piece for not less than 15 hydrants. In accordance with the provisions of the ordinance the plant was built and free hydrant rental furnished for the 4½ years. The village used the 15 hydrants during the following year, but when a bill for $900 was presented, according to the agreement, the company was told that the board of trustees would not pay it. The company brought suit, and carried it to the Supreme Court, where it was decided that the village was authoried by its charter to make such a contract, although in some states, such as Illinois, such a period is longer than the law allows. The question arose, therefore, whether the power was lawfully exercised. The village char-

ter says: "Ordinances shall contain no subject which shall not be clearly expressed in their titles." In this case the ordinance was entitled, "An ordinance authorizing the Lincoln Land company to construct and maintain a system of water works, and use the streets, alleys, avenues and public grounds for laying their pipes and mains, in the town of Grant, in Perkins county, Nebraska." The court holds that this title has no hint of hydrant rental in it. It neither specifically nor by general terms gives notice that the ordinance contains a contract binding the city to anything in the future. It is held to be "sharply restrictive and not at all calculated to arouse aldermanic suspicion that there might be a contract concealed in the folds of the measure." The title was not an index to the contract, which was therefore decided to be void. It was admitted that the village had used the hydrants for a year, and that this service was worth the $900 charged for it, and that while the contract was void, the service rendered in good faith must be paid for by the village. The judgment against the company was accordingly reversed and the case remanded for further proceedings along the line indicated. The decision, while in favor of the company, is really productive of little victory, for the reason that a water company generally has to do business for at least five years to reach a point where it meets all its expenses, to say nothing of any profit, and if it begins its further existence with no hope of any contract with the village for fire protection, which, in a small plant, largely determine the size and cost of the works, it is deprived of a source of revenue which means nearly its sole hope of existence or continuance.

Effect of the Flat Rate for Water at Milwaukee.

The effect of the flat rate of 4½ cents per 100 cubic feet of measured water, as proposed at Milwaukee, Wis., would mean a reduction in the bills of water consumers who have meters and whose annual bills are under $375. But to the big business establishments whose bills for measured water have been over $375 a year, the new rate of 4½ cents flat will mean a very large increase, estimated by City Engineer Benzenberg at 25 per cent.

A Water Company's Judgment Against a City.

Judge Knowles of the United States Court decided in favor of the Helena Consolidated Water company of Helena, Mont., Jan. 10, to recover $10,500 from the city for water furnished during the last six months. The city contended that the contract was void because the city had not advertised for bids as required by law, and for the reason that the limit of indebtedness the law allows to be incurred had been exceeded at the time. The water company claimed that as there was but one company that could furnish the water, it was not necessary to advertise for bids; that the limit of indebtedness did not affect the case, inasmuch as it was a current expense and there was money in the treasury, or money provided for, to meet it. Judge Knowles granted the motion for judgment. The case will be appealed.

Snails in Chicago Water Supply.

Snails of a kind known as an importation from Europe have been found in the Chicago water supply. It is supposed that they have been brought over by vessels, from which they passed through the Hudson river, Erie canal and the great lakes to the vicinity of Chicago. They have been found in this country for about fifteen years, but were first detected in Lake Michigan three or four years ago. To destroy them after they have passed the cribs is impossible, so the engineering department of that city is trying to devise some method of keeping them out of the tunnels. Prof. Frank C. Baker of the Chicago academy of science advises, as the only way to get rid of them, to scrape the tunnel and flush the pipes. The only way of keeping them out is to employ screens of smaller mesh at the intake, but as this would diminish the flow of water, the screen area must be increased to maintain the necessary intake capacity.

A City Cannot Increase Water Rates Contrary to Contract.

A decision was handed down in the chancery court at Birmingham, Ala., Jan. 9, by Judge Carmichael, in which he decided that the city ordinances, declaring the contract between the city and water company and prescribing a new system of water charges, are void. These ordinances were adopted in July, 1898. The company obtained an injunction against the city to prevent the enforcement of the ordinances which declared its contract void and established a new schedule of water rates. In return the city filed a bill in equity submitting a demurrer to the action and asking the dissolution of the injunction. Judge Carmichael's decision was in favor of the water works company, deciding that the contract between the city and water company, which was made in 1888, and is for thirty years, is binding on the city.

An Illegal Vote Does Not Invalidate a Contract.

The Supreme Court of Pennsylvania has rendered a decision in the case of Marshall vs. Ellwood City borough, in which the opinion of the lower court is sustained and the appeal dismissed at the cost of the appellant. Suit was brought by H. N. Marshall to prevent the borough of Ellwood from entering into a contract with the Ellwood Water company, alleging that the contract was illegal. He claimed that Councilman Roelofs was a stockholder in the water company, and as a councilman voted for the contract, thus rendering the contract illegal. The evidence showed that of the six members of council five, including Mr. Roelofs, voted for the contract or ordinance. The lower court held that while Mr. Roelofs' vote was illegal, there were enough votes without it to make the contract legal. In sustaining the lower court the supreme court said that it knew of no reason why the invalid vote of one member of councils should be held to invalidate the perfectly legal vote of the other five members.

Test of an Artesian Well Water Plant.

The report of the experts who conducted the test of the new artesian well water plant at Morris Station was submitted to the water committee of the city council of Camden, N. J., Jan. 15. The report showed that the plant was capable of furnishing only an average daily supply of 18,500,000 gallons, while the contract calls for 20,000,000 gallons. The experts furnished two sets of figures. One set allowed 2.28 per cent. slippage of the pumps and the other allowed 1.71 per cent. slippage, and the amount of water pumped each day was shown under each computation. The average daily supply during the fifteen days' test was 18,240,100 gallons, and under the weir test an average of 19,031,375 gallons was shown. The report was signed by L. E. Farnham, city engineer, and Charles E. Darrach, on the city's side, and J. W. Ledroux, Jay M. Witham and Howard Murphy, for the contractors.

Use of Meters to Prevent Waste of Water.

The use of water meters, as a means of checking the waste of water in the boroughs of Manhattan and the Bronx, is recommended in the recent report of William Dalton, water commissioner of New York City. Regarding the daily consumption and waste, which were estimated to reach 119 gallons per capita during the quarter ending June 30, 1898, Commissioner Dalton says: "It is not conceivable that so large a rate of consumption is necessary, even for luxurious use, and the conviction forces itself on the mind that a considerable portion of the supply is absolutely wasted. The consumption for June this year exceeds that for June of last year by 17,000,000 gallons. If this rate of increase were to continue, even the great resources of the Croton, Bronx and Byram watersheds would be exhausted or exceeded in less than ten years."

The Passing of the Horse.

The incorporation of the Auto-Truck company, which is to do a general trucking business in New York City, Brooklyn, Jersey City and other suburbs adjacent, will, in the opinion of Richard Croker, retire the horse from business purpose, although it will always hold a place in the affections of mankind as a pet, for pleasure driving, speeding, etc. He says: "Self-propelling vehicles will allow the city of New York to be one of the most beautiful cities in the world, as the pavement can be asphalt, and the removal of the horse will obviate wear on the pavement, will greatly facilitate the handling of freight and will remove the dilapidated buildings now occupied by stables."

Doubtful Tenure of a City Clerk.

According to a law of 1895, changing cities like Plainfield, N. J., from the third to the second class, the term of James T. MacMurray, city clerk of Plainfield, expired with the close of 1898. An opinion has been rendered to the common council, however, by the corporation counsel to the effect that the law is unconstitutional, and, therefore, inoperative in this case, and that the city clerk holds office for another year. The new council accepted this opinion in silence and continued the city clerk in office. The laws and ordinance committee took the ground, Jan. 17, however, that the constitutionality of the law can be passed upon by the supreme court, and, whether a law is constitutional or not, as long as it stands unrepealed it is operative, and that the common council had, for two meetings, been legally without a clerk.

Estimates for Public Works in Chicago.

L. E. McGann, commissioner of public works, Chicago, Ill., has submitted to Controller Waller estimates of the appropriations he will need this year. They are as follows: Street cleaning and repairing, $670,083; garbage collecting, $479,508; other street department expenses, $529,798; bridge construction, $2,186,240; bridge and viaduct repairs, $329,950; water pumps and tunnel con-

tracts (water fund), $3,183,800; sewer department, $324.75; water office (water fund), $290,676; commissioner's office, $27,900; map department, $16,490; maintenance city hall, $89,638; total, $8,128,858.

Discovery of a Cavern Under a Pavement.

When making his annual inspection of the sewers of Kansas City, Mo., recently, Superintendent of Streets Sloan was startled to find a cavern, ten feet square and fifteen feet deep, directly under the intersection of Fifteenth and Walnut-sts. The roof of the cavern was the concrete foundation of the asphalt pavement above. Small caverns and tunnels diverged in every direction, whose bottoms consisted of liquid mud from two to ten feet in depth. The cavern has probably existed for months, and that no heavily loaded team has been precipitated to the bottom, fifteen feet below, is regarded as a most remarkable feature. This is an old main sewer, constructed of rough stone four feet wide and six feet high, and built so long ago that there is no record of it in existence in the city engineer's department. The stone walls have been loosened and washed away and the foundation undermined by heavy rains pouring through the sewer. With the stone work gone, the earth followed rapidly, until this big cavern was hollowed out. The fact that the surface of the street was constructed of asphalt and concrete and was impervious to water was the only reason that it had not also been carried away.

Moving of a Bridge.

The moving of a 220-ton bridge crossing the Kinnickinnic river at Milwaukee, 250 feet down stream, was accomplished recently by the engineers of the Chicago & Northwestern railway. The bridge was a single track draw, and it was removed to a new foundation. It was floated on two scows, one on either side of the center, which were sunk with 90,000 gallons of water. With the scows in proper position the water was pumped out and the bridge gradually lifted from its foundation and towed to the new foundation by two tugs. The bridge, which was in perfect condition, was removed to make way for a double-track structure of the latest pattern.

Liability for Defective Sidewalks.

In the case of the town of Williamsport, Ind., vs. Ada L. Lisk, the appellate court decided recently that a person injured by reason of defects in the sidewalk, of which he had knowledge, may recover from the town in which the sidewalk lies, if it also had notice of such defects, and the injured party was hurt while using care commensurate with the known danger.

Repair Clause of a Paving Contract.

The Kansas court of appeals handed down a decision recently in the case of city of Kansas vs. Hanson et al., which involved the repair clause in a paving contract. The clause in question read as follows:

"The contractor expressly agrees to give a good and substantial bond to maintain in good order the aforesaid pavement for --ve years after the date of its acceptance, and binds himself, his heirs and assigns, to make all repairs which may, from imperfection in said work or material, or from any crumbling or disintegration of the material, become necessary within that time; and the contractor shall, whenever notified by the city engineer that such repairs are necessary, at once make such repairs at his own expense, and, if they are not made within 15 days after the date of said notice, the city engineer shall cause such repairs to be made at the expense and cost of the said contractor."

The court holds "that such a clause is something more than a mere guarantee of the performance of the contract; that the bond makes the contractor pay for any faults or errors of the inspection or other engineering work done by the city, and that such a clause must render the cost of the work, met by owners of abutting property, higher than would otherwise be the case. The clause was held to be illegal.

Liability of a City for Damages from Street Cleaning and Garbage Disposal.

The supreme court of Indiana has decided, in the street cleaning and garbage disposal case of the city of New Albany vs. Morris M. Slider, that (1) where a city disposes of the garbage and filth collected by it in cleaning its streets and alleys, in such a way as to create a nuisance, it is liable to a property-owner for special damages suffered by him on that account; (2) the right of a citizen to maintain an action for damages sustained by the creation of a nuisance in disposing of street cleanings is not affected by the fact that the removal of such matter from its streets was necessary for the benefit of all its citizens, including plaintiff.

Electric Light in Sewers.

A plan for lighting trunk sewers during their construction has been evolved by W. O. Kleine, city electrician at Cincinnati, O. The plan is to have a portable electric plant constructed and placed in the sewer, to which wire is attached, the wire to be advanced as the work progresses.

Reduction in the Price of Gas at Newark, N. J.

A reduction of ten per cent. in the price of gas is promised in Newark, N. J., by the Essex and Hudson Gas Company, of which Bernard M. Shanley is president. The reduction of ten per cent., making the net price to consumers $1.10 per 1,000 cubic feet, will take effect April 1, with the promise of $1 per 1,000 cubic feet in a year from that date.

A New Plan for Paying for Pavements

A press report from Norwich, N. Y., says: "A life insurance company has made the startling proposition to pave the streets of Norwich and take policies on the lives of fifty or one hundred citizens in payment. The scheme is meeting with favor among many of the tax-payers and may possibly be adopted. The plan is suggested by an endowment company, and it is proposed to bond the debt with the insurance company at 3 per cent. and give as security fifteen and twenty year endowment policies on the lives of the citizens to be designated later. This would cost the village from $2,500 to $5,000 a year, and at the end of the period the policies would mature and leave enough to pay for the paving and a handsome margin besides. In the meantime, should any of those insured die, the amount of the insurance will apply on the village debt."

Lobbyists or Promoters Not Legally Entitled to Pay.

In the case of the Bermudez Asphalt company vs. G. W. and W. T. S. Crichfield the Illinois supreme court has held that a contract for service as lobbyist or promoter, where the profit is derived from the public, even though the service is rendered in legitimate ways, is not legal. The Crichfields sued for $5,115, which they claimed was due them for such services, and the court held that it was not legally collectible.

New Publications.

Powers of Municipalities—A Discussion of the Report on Municipal Program of the Special Committee of the National Municipal League. By Allen Ripley Foote.

In this pamphlet Mr. Foote reviews the principal questions discussed at the recent meeting of the National Municipal League in Indianapolis, and in arguing the various points arrives at conclusions at variance with some of those of the committee. He cites many authorities and quotes from many well-known writers in support of his position. The pamphlet will interest all who are students of municipal government, and can be obtained by addressing Mr. Foote at Takoma Park, D. C.

Hydraulic Tables for Finding the Mean Velocity and Discharge in Open Channels, According to the Formulae of Bazin and Kutter. By T. Higham, C. I. E. Publishers, Spon & Chamberlain, New York City.

This is a second edition of Mr. Higham's work, first published twenty-two years ago, except that the fifth table has been expanded so as to include nine instead of three values of the coefficient N in Kutter's formula.

"Theater Sanitation," by William P. Gerhard, is a pamphlet of fifteen pages, giving a paper read before the last meeting of the American Public Health Association, reprinted from the Sanitarian. It gives a general statement of the ordinary evils of theater buildings and the proper principles that should govern water supply, sewerage, ventilation, lighting, fire protection and cleaning.

Municipal Reports.

Report of the Superintendent of Streets of the City of Oakland, Cal., for the two years ending June 30, 1898. By M. K. Miller, C. E., superintendent of streets.

Mr. Miller's report is an interesting review of the work under his charge, and in his elucidation of the subjects treated by him much general information is introduced. He points out some of the faults and inconsistencies in the California laws relating to the duties of street superintendents, their mistaken relations to other departments of the government, the abuses with which they must contend on account of political influence, their troubles with contractors, etc. Mr. Miller enters into an extended discussion of the street problem, and the information set forth shows that his investigations of the subject have been thorough and that he has been a careful reader of this magazine.

The report states that Oakland has been cleaning its macadam streets by day labor, paying for laborers $2 per day and for carts with drivers, $3 per day. In one year the cost was $18,000 and the work was poorly done, while in a subsequent year, by more efficient supervision, the expense was reduced to $10,000. This difference was due largely to the fact that when the work cost $18,000 and was poorly done laborers were employed as objects of charity more than on any consideration of their capability for performing the required work. Mr. Miller rightly insists that this service should be conducted on business principles and not as a matter of charity. The streets paved with bituminous rock have been swept by machinery under contract at $3.38 per lineal mile. Some valuable information is given

regarding the methods of protecting streets from damage by excavation, paving along street railway tracks, the prevention of sidewalk obstruction, the cleaning of sewers, care of parks, cost of street improvements, etc. The report altogether is most creditably prepared.

Annual Report of the Board of Public Works of the city of Pawtucket, R. I., for the year ending Sept. 30, 1898.

The report of the commissioner of public works, Loren G. Ladd, embraces reports from the heads of each of the departments, and attention is directed particularly to that of the city engineer, George A. Carpenter. It is stated that the filter beds for the disposal of sewage have continued to do good work. During the year the filtering sand was largely changed and other improvements were made, such as lowering the level of some of the beds and laying underdrains. The average number of gallons of sewage treated ranged from about 47,000 daily in August to 100,000 gallons daily in September. Some valuable statistical information on the operation of the beds and analyses of samples is set forth.

Report of the Health Officer of Coldwater, Mich., for 1898. By T. J. Turner, M. D.:

The service of Dr. Hunter embraced attention to the water supply, frequent examinations of which were made, without marked unsatisfactory results. He warns the public against the dangers of well water. Referring to public lighting, he suggests that the use of unground globes for arc lights is injurious to the vision, in that it rapidly exhausts the nerve energy of the eye. He advises the use of ground glass globes for such lights. He urges immediate steps toward disposal of garbage by cremation as important in the protection of public health.

CHICAGO.—The annual report for 1898 shows that public improvements were made in Chicago as follows: Paving—Cedar, 18.83 mls.; asphalt, 8.52 mls.; macadam, 6.52 mls.; granite, 0.62 mls.; brick, 1.7 mls. The city has 3,946 miles of streets and alleys within the city limits, of which 1,248 miles are improved and 2,698 miles are unimproved. Estimates prepared for 1899 provide for about 150 miles of new pavements. Sewers—Main sewers, varying in diameter from 9 inches to 20 feet, 53 mls.; 6-inch house drains, 14.1 mls.; total cost, $1,140,000. Plans were prepared for sewerage districts as follows: Addison-ave., from the river west, estimated cost, $68,000; Lawrence-ave., from the river west, $115,000; Ninety-fifth-st. system, including 28 mls. of outfall brick sewers and a pumping station, $1,500,000.

The machinery of the various pumping stations was overhauled or rebuilt, in an effort to increase the water supply of the city, more of this work being done in 1898 than in any previous year. The capacity of the Fourteenth-st. station was increased about 30,000,000 gals. by the installation of a new pumping engine and three new boilers were added at a cost of $83,775. The capacity of the Sixty-eighth-st. station was also increased by the addition of a new 14,000,000 gal. pumping engine.

HAMILTON, Ont.—The annual report of the water works department of Hamilton, Ont., which was prepared by Engineer Barrows, shows that during the year 3.27 miles of new mains were laid, making a total of 99.07 miles; 32 street hydrants placed; 3 stop valves placed; 115 meters placed; 161 house services introduced. The water pumped was 1,697,446,460 imperial gallons, which, compared with 1,660,669,135 gallons in 1897, shows an increase of 36,797,325 gallons, being an average daily consumption for the year of 4,650,538 imperial gallons.

FORT WAYNE, Ind.—The annual report of City Engineer Randall of Ft. Wayne shows that the aggregate expenditures for all improvements during 1898 were $125,115.85, which was $106,815.17 more than the expenditures for 1897. Paving was distributed as follows: Sheet asphalt, 3.47 miles; block asphalt, .087 mile; Metropolitan block, .025 mile. The total mileage of paved streets is 23.642 miles, and the various materials used are as follows: Trinidad asphalt, 2.650 miles; California asphalt, 3.470 miles; brick, 6.455 miles; asphalt block, .088 mile; cedar block, 10.770 miles; cobblestone, .140 mile; macadam, .070 mile. A comparison of the prices paid for asphalt paving during 1898 with prices formerly paid shows a saving. Previous to 1898 there had been 2.65 miles of asphalt laid at a cost of $164,251.99. During 1898 there was laid 3.47 miles of asphalt, almost a mile more than was previously laid, at a cost of $106,969.93, a difference in total expenditure for asphalt of $57,285.06. The total length of sewers built during 1898 was two miles, one main and eight local sewers ranging from 12 to 24 inches in diameter, at a cost of $5,777.59. The total length of sewers is 54.35 miles. The board built one bridge during the year at a cost of $2,100. The cost of all improvements to property owners by assessment was $103,238.48, and the city's share was $21,877.37.

Personal.

Robert R. Evans has been re-elected city engineer of Haverhill, Mass.

Chas. Baillairge has resigned his position as city engineer of Quebec, Que.

H. Wilmot has been elected superintendent of water works at Columbus, Miss.

Louis E. Fischer, C. E., of St. Louis, Mo., has been appointed city engineer at Paris, Ill.

Daniel Fehl, superintendent of highways at McKeesport, Pa., died Jan. 6, aged 67 years.

C. R. Felton has been appointed city engineer to succeed B. R. Chapman at Brockton, Mass.

Jeremiah J. Desmond has been appointed a member of the water board to succeed Mr. Junkons at Lawrence, Mass.

John J. Sullivan of Kennedy & Sullivan has been re-elected water commissioner of Holyoke, Mass., for three years.

George Bowers has been appointed city engineer and Cleveland H. Cheney superintendent of streets at Lowell, Mass.

Herbert J. Bowman, C. E., and ex-superintendent of water works at Berlin, Ont., has been elected water commissioner.

Harry Miles has been appointed city engineer for two years and Cornelius R. Collins city attorney, Michigan City, Ind.

Alexander C. Humphreys of Humphreys & Glasgow, New York and London, has been elected president of the Buffalo City Gas company.

W. H. Emerson has been appointed water commissioner, George A. Grant superintendent of streets and Arthur L. Beals city engineer at Brockton, Mass.

L. B. Youngs has been renominated as superintendent of city lighting and water works and member of the board of public works at Seattle, Wash.

Frank C. Kimball has been appointed superintendent and manager of the Knoxville Water company, Knoxville, Tenn., to succeed W. H. Hague, resigned.

Prof. Floyd Davis, Des Moines, Ia., has been engaged to examine the water furnished to the city of Oshkosh, Wis., by the Oshkosh Water Works company.

Joseph J. Biesel, who invented a kind of concrete for pavements, some of which has been in use in Central Park, New York City, for thirty years, died of heart failure on a Broadway cable car Jan. 11.

Capt. Charles P. Kahlo, First U. S. Volunteer Engineers, died in Baltimore, Md., Dec. 30, of typhoid fever, contracted while in Puerto Rico. He had served as city surveyor of Baltimore, was for many years the assistant city commissioner and had charge of the storm-water sewers and pavements.

Col. John N. Partridge has been appointed superintendent of public works of New York State. Col. Partridge has held executive offices under a number of Brooklyn's mayors, and for eleven years he was president of a street railway company of that city, which has since been absorbed by another corporation.

Senor Don George Jacquillon, scientist and expert civil engineer of Bluefields, Nicaragua, is at the Denechand Hotel, New Orleans, La. Mr. Jacquillon has been consulting engineer for the municipal government of Bluefields for a number of years and is here for the purpose of purchasing piping, etc., for a system of water works for Bluefields.

John H. Shrope has been elected superintendent of sewers at Flemington, N. J.

Christopher Harrison has been appointed city engineer at Everett, Mass.

Warren R. Keith has been appointed superintendent of streets, Frank Gardner water commissioner and Charles R. Felton city engineer at Brockton, Mass.

G. W. Sublette has been elected city engineer to succeed Frederick W. Cappelen, M. Am. Soc. C. E., at Minneapolis, Minn. Ellis R. Dutton is assistant city engineer.

William McDonald, ex-city engineer of Altoona, Pa., died of pneumonia, Jan. 5, aged 76 years.

Henry Stuart Wetherbee, superintendent of water works, Rome, N. Y., died Jan. 10, aged 57 years.

James Duane, M. Am. Soc. C. E., assistant engineer of the Croton Aqueduct Commission, died of consumption at his home in New York City Jan. 12, aged 47 years.

George A. Wetherbee has been appointed city engineer, Frank H. Carlisle street commissioner, Sylvester Baxter park commissioner and Clarence A. Perkins water commissioner at Malden, Mass.

H. H. Farnum, M. Am. Soc. C. E., has been appointed chief engineer of sewers of the borough of Bronx, New York City.

John H. Enright has been appointed city engineer at North Adams, Mass. Mr. Enright held this position previous to his recent term as commissioner of public works.

H. A. Cook has been re-elected water works superintendent, Philip Holmes city electrician and D. N. Cook street commissioner at Salem, Mass.

John P. Prichard has been re-elected superintendent of streets at Somerville, Mass.

Frank H. Mills has been re-elected city engineer, George Batchelor commissioner of highways, Alphonso Gaulin water commissioner and F. E. Holden sewer commissioner at Woonsocket, R. I.

Louis E. Fischer, who has been assistant city engineer at Kewanee, Ill., for some time, has been appointed city engineer at Paris, Ill.

George W. Harrison was elected president of the water board Jan. 4 at Atlanta, Ga., to succeed Judge George Hillyer, who remains a commissioner. L. Bloodworth and N. McCullough are the other members of the board.

F. Herbert Snow, Assoc. M. Am. Soc. C. E., has been re-elected sewer commissioner for three years at Brockton, Mass.

John Caulfield has been re-elected secretary of the water board at St. Paul, Minn.

Norman A. Williams, president of the N. A. Williams company, Chicago, Ill., and prominent in the manufacture of sewer pipe and fire clay, is dead.

Rev. C. W. Blodgett, one of the leading preachers of Detroit, in a recent letter to President Moreland of the Board of Public Work, which received the editorial indorsement of the Detroit Journal, said: "Whatever criticism may be passed on the municipal government of Detroit, it must except our board of public works."

TECHNICAL AND TRADE MEETINGS.

Illinois Society of Engineers—Mr. Alvord on Getting Jobs.

The fourteenth annual meeting of the Illinois Society of Engineers and Surveyors began on Wednesday, Jan. 25. Prof. A. N. Talbot, in welcoming the society, referred to the fact that the university had been instrumental in starting the society and called special attention to the great improvements in that institution in the past thirteen years. The report of the executive secretary and treasurer showed a healthy condition of finances and eighty-six members in good standing, and the report of the executive board added eight new members to this number, making the total ninety-four, which is the largest membership the society has ever had.

The afternoon session was taken up with discussions of the location of section corners and centers of sections and of the construction of public highways. The former discussion was quite lengthy and animated, as usual, and with no nearer approach to definite decisions.

The following extracts from the report of the committee on public highways, by O. F. Dubuis, chairman, will give the principal points which were discussed: U. S. Civil Engineer Meigs has reported at the good road convention, held recently at St. Louis, that the using of crude oil for surfacing soft road material will prevent water from penetrating and also form a reliable crust for traffic. The cost of 100 square feet is 90 cents for a barrel of crude oil, plus labor and handling. Experiments on that line should be followed up by our members who are in a position to do so.

The road section of the Department of Agriculture is taking up this line of experiment and ask to learn of results:

1. The wearing surface from three to four inches in thickness must be of the hardest road metal obtained and crushed to a uniform size, not exceeding three-fourths inch rung. The more cube-shaped the parts will crush the better they will pack into a hard, uniform surface. Round and flaky pieces do not so readily clinch together. The crushed metal should be sized from pea to three-fourths-inch ring, and what is left used only as a binder to fill up the voids and a light top dressing over the finished roadway when completed. From experiences I have found one yard of fine to be the proportion for seven yards of coarse material. All granite, trap rock, field boulders and bank gravel are good metal when crushed to required size.

2. The crown of macadam road should be not less than five-tenths nor more than six-tenths of an inch per foot of half the width of the road. This is to say, a twenty-five-foot-wide road should have a crown not less than .62 and not more than .75 of a foot. Where summits and valleys are necessary in the gutter line these figures may vary, as the center line of the road must be kept uniform.

3. The foundation, or that part below the wearing surface, can be built of softer material, provided it does not absorb water. The thickness of this foundation should be not less than six inches, so as to allow the using of large material that will not drive into the sub-grade during freshet or spring thaw. Field boulders, spawls, coarse gravel, provided there is not a surplus of sand, also mill cinders (not ashes) are good foundation material. This base must be uniformly spread and leave no void, the top surface to correspond to the final surface.

4. The sub-grade to be graded uniform, though if road material is plentiful it is preferable to fill small depressions at a small excess of cost, to that of soil grading for the reason that loaded teams will cut the rough, fresh soil and bank wheel ridges or ruts that will mix with the foundation and be the cause ultimately of spongy places.

These four paragraphs contain the sum and substance of a general specification for the building of a macadam road.

The evening session was opened with a paper by Prof. W. D. Pence describing the surveying standards of the University of Illinois. The remainder of the evening was taken up with discussions of engineering ethics. These discussions were very interesting.

Mr. J. H. Burnham, contractor, of Bloomington, Ill., presented a paper on a proposed method of improving our public contracting system.

Mr. Burnham said: "Engineers are perfectly familiar with the difficulties arising under our present system of letting contracts publicly to the lowest bidder. These conditions have become intolerable alike to contractors and engineers, and it is entirely probable that the tax-paying public is all ready for an improvement, as we have every reason to believe that our tax payers are willing to pay the actual cost of good work, together with a living profit to the contractor. This living profit it is now no longer possible to obtain; the inexorable law of remorseless and unscrupulous competition having long since driven bidders below prices which will allow for cost, risk and a living profit. Unrestricted competition therefore being considered undesirable in general railroad management, and some wiser and better system being sought for, we have good reason to apprehend the way has been somewhat prepared for a consideration of some possible method for restricting competition at public lettings within some wise and reasonable bounds; bounds which shall be of permanent advantage to the general public. This public advantage, however, is the only advantage possible for us to discuss.

"If any method can be found which shall be an advantage to the public, it is to be hoped this will also be the interest of the honorable contractor, and whether it results to his advantage or not, he must submit to the improved method. But in the last nine years I have partially evolved a plan for improvement of methods and feel it my duty

to bring it forward for the consideration of this society. All will admit that what we need is to devise some plan which will, at least, partially insure that most of our public work shall fall into the hands of such bidders as were deemed desirable by Prof. Ira O. Baker, when he said: 'The character of the bidder should be taken into consideration. If his character will not pass for general honesty, uprightness and fairness in his business, his bid should be thrown out.'

"Again, the experience of bidders must influence largely the letting of contracts. Every man awarded a contract should have an intelligent understanding of what his contract involves, and if he does not, his bid should be laid aside at once. The quality may next be made a test. I mean their financial ability to conduct the work to completion in the allotted time. I think that by applying the foregoing rules to all classes of letting contracts very litt'e trouble would be occasioned in getting the work well done for a reasonable amount.

"Now let us provide for the state appointment of competent examining boards to examine persons who desire to bid to pave our streets, lay our sewers, build our water works and electric light plants, erect our bridges and perhaps to other equally impotant bidders for work requiring technical knowledge.

"This board, following the precedents already established, would license persons now in those occupations, against whom no charges of incompetency or dishonesty were found, and in examining new aspirants would, as is now the case in examining architects and plumbers, give very careful consideration to their qualifications as prescribed by the proposed legislation.

"The list of bidders should be licensed for each department of public work, allowing contractors to qualify for as many departments as they desire. Then the examiners or other proper authority should receive regular reports from officials letting contracts, which report should grade the bidders according to his honesty or efficiency in carrying out the work of the year. The next list of licensed bidders should not contain the names of the dishonest, ignorant or inefficient contractors. It would not be long under this system before the list of licensed bidders for public work in every intelligent community would become as honorable as is the list of qualified lawyers, physicians, druggists and architects, or any other body of qualified persons who are under the control of law or standard of qualification."

Mr. Charles C. Brown presented a paper on the general subject of engineering ethics, in which he gave the definition of ethics and of engineering and explained the various points in these definitions. He then gave the results of some discussions of the definition before engineering societies, showing the restricted view which most engineers take of the matter and the desirability of full discussion.

Mr. J. W. Alvord, in his paper on "The Theory and Practice of Getting Jobs," gave a humorous and rather sarcastic description of the results of strict adherence to the common theory of the method of looking for work. He summed up on the practical side in the following paragraphs, which will give a good idea of the spirit of the whole paper:

First. Find your job. This is quite necessary. I have completely discarded the theory on which I started in, that your job should find you. It may work once in a while, but, as a rule, a needy engineer out of work is a great deal keener hunter than a lonesome job is. After you have found jobs for a good many years it is possible that some stray jobs may find you, but I wouldn't count on it. They are only the few bright beams heaven sends to illumine our dreary pathway, and should be so considered and accepted.

Second. Know a great deal more about how that job ought to be done than anybody else around. There is no doubt at all that this is a very important requirement indeed in the practice of getting jobs, but it is one which I feel almost ashamed to mention, and, indeed, would have forborne to speak of it had it not been that occasionally I have met enthusiastic and confident engineers eager and willing to lend a hand in the great work of harnessing the forces of nature, but a little uncertain as to the difference between the breeching and belly-band. One enthusiastic friend of mine who had offered to design and construct a $25,000 water works for $25 confided to me that it was his intention to read up on the subject nights and get into that line of business. He seemed disappointed when the water works committee intimated their unwillingness to "place" the matter in his hands because he had heard of water works men who charged $50 a day and expenses and thought it might be a lucrative business. This delightful trait of ambition in our profession should be commended, could it only be turned into proper channels, but the greatest problem we have is how to direct the energies of such would-be members into ethical discussions on the standing of the profession or society resolutions upon the unsatisfactory condition of the remuneration of engineers.

Third. Know the men who have the jobs to give. This last rule seems also to be one of those delightfully simple propositions in theory which are found so difficult in practice. The theory of the thing is that an engineer's reputation ought to precede him everywhere. In practice he is usually exceedingly glad if it will only follow him at a respectable distance. People with jobs to give want to see you, poke your ribs and put you through your paces as I have elsewhere intimated. And if you would like to be their "hired man" (which is the plain but unused name for it all) it is best for you to go and submit yourself to the process as gracefully as you can.

On Thursday morning a visit was made to the septic tank of the Champaign sewerage system, the working of which was afterward discussed by Prof. A. N. Talbot. The entire morning was given up to discussions of various subjects connected with the design and construction of sewers.

Among the papers embraced in the remainder of the program were the following: "A New Form of Sewer Invert Block," Prof.

A. N. Talbot; "The Relation of the Constitutional Limitation of the Financial Powers of Municipalities to Public Works," Prof. Charles W. Tooke; "Some Details of Modern Street Railway Construction," W. H. Rosencrans; "Concrete in Construction," V. K. Hendricks; "Water Works Improvements," W. S. Shields; "Test of the Aurora Pumping Engine," Prof. L. B. Breckenridge; "Commercial Transformation of Energy," D. W. Mead; "Central Heating Plant," A. C. Loomis.

The remainder of the program was occupied with committee reports and discussions, the latter embracing the subjects of street paving and drainage for small cities and water purification.

Indiana Engineering Society.

The Indiana Engineering Society held its nineteenth annual meeting at Indianapolis, Ind., Jan. 24, 25 and 26. Papers were presented as follows: "Methods of Testing Paving Brick," Prof. William K. Hatt of Purdue University; "Road Maintenance," Prof. Daniel B. Luten, Lafayette; "American vs. English Progress in Sewerage Purification," F. Herbert Snow, Boston, Mass.; "Purification of Water Supplies," John W. Hill, Cincinnati, "The Field Notes," John W. Fawcett, Delphi; "The County Surveyor and His Work," W. W. Clogston, Bloomfield; "Farm Drainage and How," J. J. W. Billingsley, Indianapolis; "Drainage," J. S. Spiker, Vincennes; "A Botanical Survey," J. E. Alter; "Street Paving," B. J. T. Jeup, city engineer of Indianapolis; "City Monuments," John V. Coyner, surveyor of Marion county. The paper by Mr. Jeup was read by George R. Boyce, assistant city engineer. Mr. Jeup said that while brick is not favored for streets by the people of Indianapolis yet he recommends this material as the best and most economical for smaller cities.

In his paper on "Methods of Testing Paving Brick," W. K. Hatt of Purdue University said none of the ordinary tests, except the rattler test, would bring good results; that tests of this kind, made with or without scrap iron, would readily distinguish good from bad brick; that fifteen kinds of paving brick, such as were laid in Detroit streets, had been tested at Purdue University, and that the rattler test had shown in their true worth.

Officers were elected as follows: President, A. J. Hammond, Terre Haute; vice-president, J. S. Spiker, Vincennes; secretary, J. B. Nelson, Indianapolis.

National Brick Manufacturers' Association.

The thirteenth annual convention of the National Brick Manufacturers' Association will be held in the association hall of the Great Southern hotel at Columbus, O., Feb. 7 to 10. Some of the papers that will be presented are as follows: "The Evolution of the Paving Brick," H. A. Wheeler, St. Louis, Mo.; "Burning Brick in Down Draft Kilns," Robert Twells, Wickliffe, O.; "Modern Methods of Drying Brick," J. W. Tester, Montreal, Canada; "Some of the Faults of Modern Clayworking Plants," Anders Persson, Bangor, Me.; "Brickmaking as a Profession," J. Fred Smith, Omaha, Neb.; "The Clay Age," W. H. Kriegshaber, Atlanta, Ga.; "Profit and Loss in Brickmaking," John Miller, Washington, D. C.

American Society of Civil Engineers.

The forty-sixth annual meeting of the American Society of Civil Engineers was held in New York City on Jan. 18 and 19. The official reports showed that the total membership is now 2,124, a net increase during the year of 44. The receipts from all sources amounted to $73,425 and the disbursements $65,725.63, leaving a balance on hand of $7,699.91. Mr. E. L. Corthell proposed the organization of an engineering congress to be held in Paris during the exposition of 1900, but the matter was left for future action of the directors. A resolution favoring independent meetings of the junior members was favorably voted on. The election of officers for the ensuing year resulted as follows: President, Desmond FitzGerald of Boston; vice-presidents, Robert Moore of St. Louis and Robert Cartwright of Rochester; treasurer, John Thomson of New York; directors, John A. Bensel, C. W. Buchholz and Samuel Whinery of New York, Edmund K. Turner of Boston, Palmer C. Ricketts of Troy and James D. Schuyler of Los Angeles.

Ohio League of Municipalities.

The annual meeting of the Ohio League of Municipalities was held at Zanesville on Jan. 24, 25 and 26. The visitors from Ohio cities were welcomed by Mayor Gibson, who in his address claimed for Zanesville distinction as "the clay city of Ohio" on account of its paving brick and sewer pipe industries. He spoke also of the importance of having one general form of government for the cities and towns of Ohio. Samuel L. Black of Columbus, president of the league, responded to the welcome. The principal discussion at the convention was on the codification of municipal laws in

Ohio, which has been in progress under a special commission, and an address was delivered by Mayor Young of Akron on "The Commission's Plan of Municipal Government."

Illinois Clay Workers.

The Illinois Clay Workers' Association held its annual meeting at Peoria, Ill., Jan. 17-18. Among the papers presented were the following: "Street Paving," A. D. Thompson, city engineer, Peoria; "The Future of Clay Products," G. A. Tompkins, Avon; "Making Paving Brick Not Cheap, but Good," F. Plumb, Streator; "Tiling Swamp Land," L. C. Streeter, Grand Park. A paper was read by Frank W. Moulton on "The Future of Brick Pavements in Chicago," in which he sought to show the advantages of well-constructed brick pavements over all other kinds. He said "the brick pavement of today, probably more nearly than any other, fulfills the conditions required in a perfect pavement, for it is impervious to moisture, insures a good foothold to horses, is smooth, is reasonable in price and never wears slippery. It withstands a greater crushing test than granite. It is practically indestructible and will outlast any other known pavement. The paving of a street improves business, empty stores find tenants and the abutting realty is enhanced in value. The paving of one street in a poorly paved section of the city congests traffic on the newly paved street. The wear and tear of pavements would be greatly lessened by the use of wide tires on vehicles and would result in a saving of several million dollars a year in street and road repairing."

Officers were elected as follows: President, H. T. Townsend, Avon; vice-president, C. C. Barr, Streator; secretary, G. C. Stoll, Wheaton; treasurer, Wm. Stere, Mendota. It was decided to appeal to the legislature to abandon the making of brick at the Clinton penitentiary. A committee of three will be appointed to formulate a plan whereby the convict labor of the state may be used in building good roads, dredging the rivers and building canals. After plans are completed the legislature will be asked to pass a law to this end.

Financial Irregularities of the League of American Municipalities.

According to a report in the Columbus, O., Post-Press on January 24th, the League of American Municipalities is having a continuation of the official irregularities in its financial affairs which brought discredit upon it at its meeting in Detroit last summer. The Post-Press says that a meeting of the executive committee was called, to be held at Zanesville, O., during the session of the Ohio Municipal League, for the purpose of taking action on the matter, but according to a later report, the meeting was not held because the members of the committee failed to respond to the call. It is said that the same irregularities disclosed by the investigating committee at Detroit have since been practiced.

Notes of Technical Meetings.

The nineteenth annual meeting of the Iowa Brick & Tile Association will be held at Sioux City, Ia., March 1 and 2.

The next annual convention of the American Water Works Association will be held in Columbus, O., May 23 to 26 inclusive.

The annual meeting of the Western Society of Engineers was held in Chicago Jan. 3 and officers elected as follows: President, Onward Bates; first vice-president, N. O. Whitney; second vice-president, T. L. Condron; secretary, Nelson L. Litten; treasurer, C. W. Melcher; trustee, August Ziesing.

The eleventh annual meeting of the Iowa Engineering Society was held at Iowa City, Ia., Jan. 18 and 19. Some of the papers read were as follows: "Advance of Metric System of Weights and Measurements," B. Schreiner; "How to Succeed," Peter J. Peterson; "Linn County Roads," J. H. Lary.

The New England Water Works Association held its monthly meeting Jan. 11 at Boston. The recommendation of the executive committee that the next fall meeting be held at Syracuse, in accordance with the invitation of Wm. R. Hill, M. Am. Soc. C. E., was adopted.

The formal disbanding of the Association of Engineers of Virginia December 31, 1898, has been announced by John A. Pilcher, secretary, who says it has been found impracticable to continue the organization longer. The publications which the associations now have on hand will be turned over to the library of Washington and the University at Lexington, Va.

The annual meeting of the Canadian Society of Civil Engineers was held at Montreal, Canada, beginning Jan. 10. Officers were elected for 1899 as follows: President, W. T. Jennings, Toronto; vice-presidents, P. N. St. George, K. W. Blackwell, E. H. Keating; secretary, C. H. McLeod; treasurer, H. Irwin; council, C. H. Duggan, John Kennedy, Thomas Monro, R. N. Ruttan, E. H. Rust, G. A. Mountain, D. Macpherson, C. E. W. Dodwell, W. B. McKenzie, E. Marceau, W. Chipman, J. Galbraith, Stuart Howard, E. A. Wilmot, St. George Boswell.

The second annual meeting of the Western Water Works Association was held at Chicago Jan. 18, 19 and 20. This association has for its object the protection of the interests of private water companies. Officers were elected as follows: President, B. L. Dodge, Cicero Water, Gas & Electric Light Co.; vice-president, A. F. Callahan, Danville Water Co.; secretary, H. E. Kessler, Rogers Park Water Co.; treasurer, Thos. R. Lyons, Commercial Loan & Trust Co.; executive committee, W. G. Maxcy, Oshkosh, Wis.; W. E. Bull, Quincy, Ill.; F. A. W. Davis, Indianapolis, Ind.; C. G. Wing, Ludington, Mich.; Wm. Molis, Des Moines, Ia.

MACHINERY AND TRADE.

Bright Outlook for Paving Brick Manufacturers.

F. G. Matteson of the Purington Paving Brick company, Galesburg, Ill., recently made a visit to the cities in Iowa and Illinois within the scope of the territory in which the company operates. He said that "there is not a city in which brick paving has been laid that is not going to do more of it in the coming year. Not only this, but cities that have not used brick pavements heretofore are going to lay some of it this year. It has been something of a surprise to me, and still when you come to think of the conditions of the money market, it is not so strange. Everything is 'looking up.' Business is better, conditions are changed. The banks throughout Illinois paid premiums on paving bonds last year, and I understand that the bankers are interested in seeing the public improvements go ahead."

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for ten cents.)

614,597—Nov. 22, 1898.—Means for Conveying Cables, etc., Through Underground Conduits—John Wrigley, Elmira, N. Y.

614,653—Nov. 22, 1898.—Apparatus for Developing and Regulating Water Supply—Howard V. Hinckley, Topeka, Kas. Wells located at different levels, a box or chamber in the bottom of each well and a gravity discharge from each box into the next lower box.

615,182—Nov. 29, 1898.—Drinking Fountain—Hampden Hyde and John Buckley, Rochester, N. Y. assnrs. to the Hyde Fountain Co., same place. An upwardly discharging nozzle surrounded by, but isolated from, walls which are higher than the orifice of the nozzle (thus preventing lip contact with the nozzle) and a discharge opening below the orifice of the nozzle and larger than the nozzle orifice.

615,537—Dec. 6, 1898.—Street Sweeper—A. C. A. Dupuy, New Orleans, La. A stone-picking wheel is mounted in front of the usual rotating brush, the said wheel picking up any stones which may be in the roadway and depositing them in a separate compartment.

615,824—Dec. 13, 1898.—Swivel Drawbridge—Joseph Edwards, New York, N. Y. A device for automatically raising and lowering the aprons of the bridge by the rotation of said bridge.

616,515—Dec. 27, 1898.—Folding Steps for Lift Bridges—Thomas H. Williams, Utica, N. Y. assnr. one-half to Thomas Wheeler, same place.

616,536—Dec. 27, 1898.—Suspension Bridge—Thomas T. Hitson, Hermitage, Mo. A central frame having vertical streets. The usual suspension cables supported by towers and supporting the frame and two truss cables supported by the towers, one engaging the lower ends of the streets of the central frame and the other engaging the upper ends of said streets.

Trade Notes.

Andrew N. Eastwick, Edwin Hall and Herbert W. Geshwind of Philadelphia, Pa., entered into a partnership Jan. 2 under the name of Windsor Paving company, general contractors for artificial stone and asphalt paving.

The buildings and machinery of the Des Moines Brick Mfg. company, Des Moines, Ia., were destroyed by fire recently, causing a loss of $50,000.

The Toledo Brick Association, Toledo, O., have advanced the price of building brick to $5.50 a thousand, and sewer brick $6.

A new lock brick, designed specially for paving, tunnel and sewer work, has been patented by Henry Loftie of Syracuse, N. Y

The promoters of the proposed sewer pipe trust have, according to press reports of Jan. 12, secured options on the Akron (O.) plants.

The Vincennes Steel Bridge Mfg. company has been incorporated and will erect a plant at once in Vincennes, Ind. The incorporators are John L. Oliphant, Henry County, Ind.; Frank L. Oliphant, Denver, Col.; Jacob L. Riddle, Greene County, Ind., and other capitalists.

The German Rock Asphalt company, Buffalo, N. Y., elected directors Jan. 5 for the ensuing year as follows: Charles E. Williams, Wm. H. Kinch, Frank L. Bapst, Pliny B. McNaughton and Wm. H. Abro.

John McVicar severed his connection, Jan. 11, with the firm of George E. Currie, paving contractors of Detroit, Mich., with which he has been associated ever since he returned from the board of public works. Mr. McVicar will take a much-needed rest before engaging in business again.

The Alton Paving, Building and Fire Brick company has re-elected Edward Rodgers president and Eben Rodgers secretary and treasurer.

The Trinidad Asphalt Mfg. company has been incorporated at St. Louis, Mo., with the following directors: J. G. Baker, J. Scott Porter, H. L. Block, F. W. Terpenning, C. W. S. Cobb and J. B. Johnson.

The American Pipe & Foundry company, Chattanooga, Tenn., which owns and operates plants at Bessemer, Anniston and Bridgeport, Ala., and South Pittsburg, Tenn., contemplates, according to press reports, doubling the capacity of its plant at Bessemer and removing its general office from Chattanooga to Birmingham, Ala.

The American Roofing & Paving Supply company, Chicago, Ill., has been incorporated to manufacture roofing and paving materials by C. H. Parshall, jr., Charles G. Jiran and J. L. Emery.

The Equitable Meter company, Pittsburg Pa., has been incorporated to manufacture meters, etc., by O. F. Felix, G. J. Holdship, J. H. White, Pittsburg; C. F. Holdship, Allegheny, Pa.

John McGillan of the Bermudez Asphalt Paving company, Chicago, has ordered from the F. D. Cummer & Son company of Cleveland one Cummer portable asphalt paving plant. The plant is guaranteed by the manufacturers to turn out not less than 2,000 square yards of 2-in. topping per day of 10 hours.

F. L. Smidth & Co. have contracts for supplying the new 1,200 barrel per day plant of the Lawrence Cement company, Siegfried, Pa., with the Smidth ballmill and the patent

tubemill for use in pulverizing their clinker. The Coplay Cement company will grind both their raw materials and clinker in their new 1,200 barrel per day mill with Smidth ballmills and Davidson patent tubemills, which will be supplied by F. L. Smidth & Co.

The Gilson Asphaltum company recently shipped three cars of gilsonite to Germany.

The Michigan Portland Cement company, Coldwater, Mich., has let contracts for additional buildings and seven rotary kilns.

A paving brick plant will be opened at Danville, Ill., by C. D. Sultzaberger, formerly with Ellcock & Sultzaberger, at Springfield, Ill.

The Eastern Mfg. company, Minneapolis, Minn., has been incorporated to make paving brick by E. Smith, Gust Nelson and T. W. Chamberlain.

The Addyston Pipe & Steel company, Cincinnati, O., is reported as trying to form a combination of all the pipe and steel companies in the country.

The Webster City Brick & Tile company, Webster City, Ia., is in need of a competent man for superintendent of its plant, according to press reports.

Mr. F. E. Cole of Toledo has contracted with Hetherington & Berner for another portable asphalt paving plant. Mr. Cole states that he already has under contract about 35,000 square yards of paving for the coming season.

The San Antonio Sewer Pipe & Mfg. company, San Antonio, Tex., has been awarded a contract for furnishing the City of Mexico with pipe for a sewerage system. An addition will be added to the plant.

A successful asphalt paving company operating in a western city is in need of a thorough man of good, practical experience to take charge of their plant. Information can be obtained by addressing J. E. M., in care of this magazine.

The brick company formerly known as the East Clayton Clay Mfg. company, Nelsonville, O., will be reorganized and rebuilt in the near future. The plant will have a capacity of from 50,000 to 75,000 block per day. Baird Bros. of Nelsonville, will be connected with the company.

The Clinton Paving and Building Brick works have been closed since Dec. 23 for annual repairs and overhauling, but will in a few days resume operations. Mr. J. W. Robb, the secretary and treasurer, states that the company had a very successful year in 1898 and enters the new year practically without any surplus product and with a large demand ahead.

The Jeffrey Manufacturing company of Columbus, O., who recently took up the manufacture of standard elevator buckets and spiral conveyors, reports a very flattering trade. Their facilities are such as enable them to supply high-grade material at prices which secure a large trade for this class of machinery. The Jeffrey company's latest catalogue and prices will be sent upon application to them.

A decision rendered by the appellate court at Indianapolis, Ind., Jan. 25, reverses the decision of the lower court, which awarded a judgment of $250 to Oliver S. Clendenning in his suit against the F. C. Austin Manufacturing company of Chicago. The plaintiff had 15,000 perch of stone ready for crushing, for use in building a turnpike in Switzerland county, when he purchased the stone crusher. He claimed that the machine broke down, delaying his work to the extent of $1,500, which amount he asked for in his complaint. The lower court awarded him $250, but this was reversed by the appellate court.

The Purington Paving Brick Co. held its annual meeting Thursday, Jan. 26th, and re-elected the old board of directors, being as follows: D. V. Purington, Geo. C. Prussing, S. S. Kimbell, of Chicago, A. A. Smith, W. E. Phillips, W. S. Purington and F. G. Matteson, of Galesburg. Immediately after the stockholders' meeting the board met and elected the following officers: D. V. Purington, pres. and treas.; W. S. Purington, vice pres. and gen. mgr; Chas. H. Chamberlain, secy.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Philadelphia, Pa.—Broad-st., which is nearly 100 ft. wide, is paved with asphalt its entire length of ten miles, except about five blocks.

Saginaw, Mich.—The report of City Engineer Terry shows a total of 93,282 sq. yds. of paving, as follows: Asphalt, 47,536 sq. yds.; brick, 41,732 sq. yds.; cedar block, 4,013 sq. yds.

Pittsburg, Pa.—A decision of Judge McClung, of the court of common pleas, declared the act under which Grenfield-ave. was paved unconstitutional. The decision will, if sustained by the supreme court, affect the improvement of Grant and Beechwood-aves.

Topeka, Kan.—A bill has been introduced in the legislature which confers upon the city council the power to order paving done without regard to the opinions of property owners.

Jackson, Mich.—The supreme court has denied a rehearing in the case of the residents of W. Main-st. against Jas. K. Bogert, paving contractor. Contractor Bogart was prevented by the circuit court from laying a brick pavement on W. Main-st. He appealed the case to the supreme court and obtained a decision dissolving the injunction. He began the work of paving when a motion was filed by a resident asking for a rehearing of the case, and this was denied.

CONTEMPLATED WORK.

Portsmouth, O.—Paving is contemplated for Gallia-st.

Pittsburg, Pa.—An ordinance to improve Diamond-st. has been passed.

Brockton, Mass.—Paving is contemplated for the main thoroughfare.

Sioux City, Ia.—Brick pavement on Pearl-st has been petitioned for.

Washington, Pa.—This town has voted to expend $60,000 for paving.

Painesville, O.—Brick or asphalt paving is contemplated for Mentor-ave.

Bridgeport, W. Va.—Bids will be asked soon for brick and asphalt paving.

Boulder, Colo.—The question of macadamizing Pearl-st. is being considered.

Topeka, Kan.—Resolutions have been adopted to pave Fillmore and Thirteenth-sts.

Darby, Pa.—Pine-st., between Fifth-st. and Darby creek, will be macadamized.

Adrian, Mich.—The question of issuing $5.00,000 of paving bonds will be voted on.

Burlington, Ia.—A council committee is investigating asphalt paving in other cities.

Canton, O.—(Special).—A resolution has been offered for the improvement of N. Cherry-st.

Oakland, Cal.—Portions of First and B-sts. will be macadamized. J. W. Tompkins, cy. clk.

Pittston, Pa.—The question of issuing $22,000 of paving bonds will be voted on Feb. 21.

Jersey Shore, Pa.—The proposition of issuing $13,000 of street paving bonds will be voted on.

Ambler, Pa.—The question of issuing street improvement bonds will be voted on Feb. 21.

Ft. Worth, Tex.—The question of paving is being considered. Brick and asphalt are advocated.

Seattle, Wash.—The council has decided to pave Madison-st., from First to Third-ave., with sandstone.

Selmer, Tenn.—The road between Selmer and Pittsburg Landing will be macadamized at a cost of $20,000.

Rochester, N. Y.—An ordinance has been adopted to pave Bartlett-st. with asphalt; estimated cost, $9,700.

Athens, Ga.—The question of issuing paving bonds will be voted on in February. J. H. Rucker, alderman.

Allegheny, Pa.—The issue of $63,628 bonds, for the improvement of California-ave., has been authorized.

Yonkers, N. Y.—Plans are being prepared for macadamizing Warburton-ave. north of the city line. Dept. Pub. Wks.

Hoboken, N. J.—The paving of the Paterson plank road with Belgian block is recommended by Mayor Fagan.

Butte, Mont.—Mayor Harrington and City Engineer Bickerback have recommended paving for portions of ten streets.

Detroit, Mich.—The Park Hill Land company has purchased 70 acres of land and will pave the streets of the same.

Chester, Pa.—The paving of E. Broad-st. from Edgemont-ave. to Morton-ave., with asphalt, has been petitioned for.

Lebanon, Ind.—Brick paving is contemplated for paving the public square and Lebanon-st. John Hoy, cy. clk.

Syracuse, N. Y.—Petitions have been filed with the council for brick or asphalt paving on Oak and W. Kennedy-sts.

Georgetown, O.—The town council has issued orders for Water-st. to be paved as soon as the weather will permit.

Bryan, Tex.—Paving is contemplated for Main and intersecting streets, but the material has not been decided upon.

Cleveland, O.—Plans and specifications for grading, draining and paving with brick. Beaver-st., have been requested.

Chester, N. Y.—Paving has been decided upon for Upland-st., from Twelfth-st. to Providence-ave. F. W. Harrison, clk.

Jersey City, N. J.—Asphalt paving is favored for Newark-ave. between Warren-st. and Jersey-ave.; estimated cost, $15,000.

St. Paul, Minn.—The city engineer has been instructed to prepare plans for asphalt and macadam paving for Sherburne-ave.

Boston, Mass.—An estimate of $1,000,000 for street department purposes has been submitted by Benj. W. Wells, supt. of sts.

Camden, N. J.—The paving of Eighth-st., from Vine to Elm, with Belgian blocks, has been petitioned for. L. E. Farnham, cy. engr.

Peoria, Ill.—Ordinances have been adopted for paving with brick, portions of Fourth, Elizabeth and Capitol-sts. Mayor Sapp.

Ft. Wayne, Ind.—The city engineer has been directed to make plans for asphalt paving on E. Lewis and E. Berry-sts. and an alley.

Northfield, Minn.—The council has ordered an ordinance prepared providing that all new sidewalks shall be cement, stone or brick.

Quincy, Ill.—Estimates for the proposed paving will be submitted to the board of public improvements Feb. 6. Engineer Chatten.

Chicago, Ill.—The property owners fronting Haymarket Square decided, Jan. 25, on granite as a paving material for that thoroughfare.

Petersburg, Va.—Plans and specifications will be prepared for paving; estimated cost, $50,000. An engineer has been employed to make plans.

New York City.—A resolution was passed Jan. 11th for repaving Sixth-ave., from Carmine to Thirteenth-st., with asphalt. B. P. I.

Utica, N. Y.—Resolutions have been passed for paving nine streets.

St. Paul, Minn.—A preliminary order has been passed for paving Summit-ave., from St. Peter to Sixth-st., and from College to Summit.

Loogootee, Ind.—The citizens of center township petitioned for the building of 12 mls. of gravel or macadam roads. Jas. McBride, engr.

Watertown, Wis.—Bids will be received until about the 1st of April or 1st of May for 18 blocks of brick paving. Henry Mulberger, mayor.

Cleveland, O.—Resolutions have been adopted for paving with brick, portions of Sackett, Daisy and other streets. Howard H. Burgess, cy. clk.

Toledo, O.—Plans are being made for paving portions of Greenwood and Woodruff-aves., and Delence, Nineteenth, Broadway and Twenty-third-sts.

Spokane, Wash.—Plans have been submitted for paving Howard, Lincoln, Monroe and Stevens-sts. with asphalt on 4-in. concrete foundation.

Fulton, N. Y.—Village Engineer Breed estimates that 22,000 sq. yds. of brick paving and 5,000 lin. ft. of curbing will be required on Second-st. Bids will be asked early in February.

Elizabeth, N. J.—Councilmen Ryan, Ford, Berry, Engle and others have recommended that 13 miles of streets be paved at an estimated cost of $401,400.

Atlanta, Ga.—The Mitchell-st. viaduct will be paved with asphalt, except the western

span which will probably be paved with Belgian blocks. Br. Com.

Kansas City, Mo.—An ordinance for paving about 5-mis. of streets and alleys with asphalt, brick and gravel, is before the board of public works.

Huntington, (L. I.) N. Y.—The improvement of Stuart-ave. is contemplated. Thos. J. Ritch, Thos. H. Sexton and John J. Davis, of Port Jefferson, comrs.

Kansas City, Mo.—The opening of a new boulevard, 80 and 100 feet wide, to be known as Admiral-ave., is contemplated, at a cost of about $125,000.

Jersey City, N. J.—The business men of Newark-ave., between Warren and Coles-st., are agitating the question of an asphalt pavement on that thoroughfare.

Philadelphia, Pa.—The council is considering an ordinance to appropriate $2,000,000 for paving streets in all parts of the city. Councilman Dixon, chrmn. com.

La Crosse, Wis.—Estimates will be prepared for paving King-st., between Fourth and Fifth. The special committee will recommend the use of brick.

Hartford, Conn.—The street board voted recently to ask the common council to pave Windsor-ave., from the tunnel to Suffield-st., with modern paving.

Hoboken, N. J.—Asphalt repaving will be asked for New York-ave. Plans are being prepared for the improvement of North, Irving and Waverly-sts., and Nelson and Reservoir-aves.

Milwaukee, Wis.—Henry Lohagen, Henry Rademacher, Philip Saxe and others have been appointed a committee to ask the council to pave Mitchell-st., between Second and Seventh-aves.

Topeka, Kan.—Resolutions have been passed for paving and curbing Fillmore-st., from Huntoon to Thirteenth-sts. and Thirteenth-st., from Fillmore to Clay. S. S. McFadden, cy. clk.

Michigan City, Ind.—(Special). H. M. Miles, city engineer, says a large amount of street paving is to be done this season, on Franklin, Pine, Spring, Wabash, Market, Detroit and York-sts.

Chester, Pa.—An ordinance was approved Jan. 17, providing for brick, cement or flagstone paving and curbing for the sidewalks on Sixteenth-st., from Providence to Walnut. Frank W. Harrison, cy. clk.

New York City.—The board of local improvements of the borough of Manhattan has decided to recommend that Sixth-ave., from Fifty-ninth to Carmine-st., be paved with asphalt. Jas. B. Coogan, prest.

Springfield, Mass.—Plans are being prepared for a boulevard 100-ft. wide, to extend from Water and Gardner-sts. to Forest Park via S. Main-st. and the Connecticut river to Longmeadow. Chas. M. Slocum, cy. engr.

Anderson, Ind.—The council decided, Jan. 26, to pave Ninth, Tenth and Twelfth and Jackson-st. with brick, asphalt block or creosoted yellow pine block, and to pave the sidewalks with cement. Mayor Dunlap; Cy. Engr. Rogers.

New Paris, O.—Brick paving has been suggested for the crossing of Main and Washington-sts. The special committee has been empowered to secure City Engineer Weber, of Richmond, to make a survey and establish grade lines. Mayor Brown.

Washington, D. C.—A bill providing for an extension of New York-ave., from Florida-ave. to the district line, at a cost of $37,000 for grading and macadamizing, has been favorably reported by the district commissioners.

Ft. Wayne, Ind.—Plans were ordered, Jan. 5, for asphalt block paving on portions of Calhoun, Main, Court, Clinton and Columbia-sts. City Engineer Randall was also instructed to prepare plans for paving Barr-st., from Washington to Holman, with asphalt.

Galveston, Tex.—Mayor Fly appointed a committee, Jan. 15, to go to Houston and investigate the question of asphalt and brick paving. The committee consists of Aldermen Borden, Agullo and Jones. Repaving is contemplated for the streets of this city.

Mays Landing, N. J.—The board of county freeholders decided, Jan. 11, to construct the proposed macadam road from Ventnor, through Egg Harbor twp., and South Atlantic City to Twenty-fourth-ave., Longport. J. J. Albertson, co. engr., Magnolia, N. J.

Chicago, Ill.—The residents of Michigan boulevard have petitioned the South Park Board to change the character of the dressing upon the surface of that thoroughfare, which is crushed granite on a clay gravel foundation. The park commissioners are willing to resurface the street in order to stop the annoyances complained of.

Winthrop, Mass.—A stone retaining wall about 9-ft. high extending the entire length of the beach, with a macadam driveway, is contemplated for Crescent-ave., from Great Head to Winthrop Highlands, a distance of about 5,200 ft., at a cost of $90,000. If a wooden retaining wall is built the cost will be $30,000. Selectmen Lewis and Craib are interested.

Philadelphia, Pa.—Chief Engineer Vogdes has reported to the Fairmount Park Commissioners recommendations for 1899, as follows: Completing work of widening East river drive, including macadamizing and laying of asphalt walks, $30,000; macadamizing Lincoln drive to Walnut lane, $16,000; continuing Thirty-fourth-st. drive, from its present terminus to Callowhill-st., $25,000.

Chicago, Ill.—The Chicago City Railway company made a proposition to Commissioner Mc Gann and the board of local improvements, Jan. 20, that if the property owners of Indiana-ave., from Eighteenth to Thirty-ninth-st., will pave with asphalt, the company will pave with asphalt the center sixteen feet and replace the present rails with grooved rails. The distance proposed is 2½ miles.

Clayton, Mo.—The question of public improvements, such as good roads, water supply, sewers, street lights, street crossings, etc., is being considered. An organization to be known as Neighborhood Improvement association, No. 1, of St. Louis county, has been effected to push these improvements, with officers as follows: President, Col. Chas. R. Black; vice-president, M. B. Greensfelder; secretary, Prof. J. Will Andrae; treasurer, Albert Heege; directors, Col. F. W. Rauchenstein, Thos. K. Skinker, Wm. E. Fish, R. B. Crosman, Edgar Rapp, J. B Suddeth, J. H. Harbeson, Fred Antenreith and J. J. Alexander.

CONTRACTS TO BE LET.

Atlanta, Ga.—Bids for street curbing and sewer pipe will be received Feb. 6. D. G. Wylie, comr. pub. wks.

Placerville, Cal.—Bids are asked until Feb. 7 for constructing a road. John P. Fisher, clk.

Vevay, Ind.—Bids will be received until Feb. 6 for constructing free gravel roads. Jos. E. Hart, co. audt.

Memphis, Tenn.—Bids are asked until Feb. 2 for graveling eight streets. D. P. Prescott, secy. co. comrs.

Cleveland, O.—Bids are asked until Feb. 15 for paving several streets with brick. Geo. R. Warden, dir, pub. wks.

Toledo, O.—Bids will be received until Feb. 6 for improving Milburn-ave. and Monroe-st. Lem. P. Harris, cy. clk.

Burlington, Vt.—Bids are asked until Feb. 6 for furnishing curbing and other cut stone during 1899. St. comrs.

Decatur, Ind.—Bids will be received until Feb. 16 for constructing 5.349 mls. of macadam roads. W. E. Fulk, co. surv.

Cincinnati, O.—Bids will be asked until Feb. 2 for paving E. Pearl-st. with granite blocks. A. B. Ratterman, prest. B. C. A.

Terre Haute, Ind.—Sealed proposals will be received until Feb. 7 for building cement sidewalks. Wm. K. Hamilton, cy. clk.

Rockville, Ind.—Bids will be received until Feb. 8 for building 29.57 mls. of gravel roads in Raccoon twp. S. A. Pike, co. audt.

Fayetteville, Ark.—Bids are asked until Feb. 1 for macadamizing about 2,700 ft. on College-ave. J. L. Cravens, chrmn. Imp. B. B.

Plainfield, N. J.—Bids are asked until Feb. 6 for macadamizing E. Ninth and E. Sixth-sts. and Franklin Place. Jas. T. McMurray, cy. clk.

St. Louis, Mo.—Sealed proposals will be received until Feb. 14 for paving 31 alleys with vitrified brick on concrete base and grading 9 alleys. Robt. E. McMath, prest. B. P. I.

Bedford, Ind.—Bids will be received until Feb. 22 for paving Thirteenth and Four- and guttering. W. M. Denniston, cy. clk.

Albany, N. Y.—Bids are asked until Feb. 6 for paving portions of Hamilton, Dove and Elizabeth-sts., including the following: Brick paving, 10,142 sq. yds.; straight curbing, 5,046 lin. ft.; curved curbing, 478 lin. ft.; flag, 21,137 sq. ft. 5-ft., and 1,330 sq. ft. 4-ft.; 11 receiving basins; 25,500 sq. ft. brick sidewalk; 11,444 sq. ft. sidewalk to be relaid. T. J. Lanahan, clk.

CONTRACTS AWARDED.

Jersey City, N. J.—The Barber Asphalt Paving company has been awarded a contract for paving Clendenny-ave. at $1.75 a sq. yd.

Hamilton, O.—The David Folz Paving company, Cincinnati, O., has been awarded the contract for asphalt paving in this city for $30,000.

Flemington, N. J.—A contract for macadamizing about 5 mls. of the Cranbury turnpike has been awarded to R. A. Montgomery of Lambertville for $17,640.

St. Augustine, Fla.—The contract for paving St. George-st., from King to St. Francis, with brick has been awarded to McGuire & McDonald for $9,000.

Camden, N. J.—The contract awarded to Aaron Ward recently for paving Broadway and Federal-sts and Kaighn-ave. with asphalt has been signed by Mayor Hatch.

Rochester, N. Y.—The contract for improving 2½ mls. of East-ave., under the state road act, was awarded Jan. 9 to H. B. and W. A. Gillette of Rochester for $8,200.

Duluth, Minn.—The contract for furnishing 12,000 bbls. of Portland cement was awarded Jan. 10 to the Northwestern Lime company, St. Paul, Minn., at $2.19 a barrel for the Atlas brand.

Mt. Holly, N. J.—George Banchoff of Newark was the lowest bidder Jan. 10 for building the road from Mile Hollow, near Bordentown, to the Mercer county line, 1.78 mls., at 49 cents a sq. yd., or $7,399.

Decatur, Ind.—Contracts were awarded Jan. 5 to Miller & Williams of Marion and Decatur for constructing the following: Decatur and Monroe macadam road, 5 mls., $13,449; Washington macadam road, 7 mls., $20,898.

Charleston, Ill.—The contract for paving Jackson-st. with brick was awarded Jan. 5 to Crews, Lough & Allison of Arcola at $1.25 for paving, 44 cts. per running ft. for curbing and $15 for catch basins.

Indianapolis, Ind.—Contracts were awarded Jan. 20 as follows: Graveling first alley east of Senate-ave., 17 cts., and first alley west of Delaware-st., 15 cts., J. Harry Roberts; first alley east of Reisner-st., W. H. Abbot, 17 cts.

Oskaloosa, Ia.—The contract for 15,600 sq. yds. of brick paving was awarded Jan. 10 to George H. Carlon & Son, city, at $1.29 a sq. yd.; cement curb, 8,900 ft., 33 cts.; total, $23,131. Five other bids were received, ranging from $1.32 to $1.38½.

Houston, Tex.—The city council reported in favor of the Ayres Asphalt Paving company Jan. 16 for the Main-st. paving at its bid of $42,856. The other bids received were: Barber Asphalt Paving company, $49,036; Hipp & Key, $44,642; Louisiana Improvement company, $43,597.

Norwood, O.—Bids were received Jan. 7 for building a half-mile of macadam road, the successful bidder to keep the road in repair for five years, as follows: Frank Folz, Cincinnati, $14,001; John Snyder, Norwood, $14,712; L. Drach, Cincinnati, $13,724; A. J. Henkle & Bro., Cincinnati, $16,088; John Trapp, Newport, Ky., $13,891.

Beaumont, Tex.—Bids were received Jan. 5 for 10,000 sq. yds. of paving, 2,500 sq. yds. of excavation and 2,560 lin. ft. of curbing, and the contract awarded to W. C. Humphreville of Houston, as follows: Vitrified brick on 6-in. concrete, $1.96½ a sq. yd.; excavating, 20 cts. a cu. yd.; stone curbing, 65 cts. a lin. ft.

New York City.—The New York Mastic Works has been awarded a contract for constructing an asphalt strip in Long Island City for $18,646.

Canton, O.—(Special.)—Bids were received Jan. 12 for filling Jackson-st., which, including unloading and surfacing of furnace slag, were as follows: T. K. Turnbull, gondola car, $1.10 per car; flat car, 75 cts. per car; John Hadley, $1.50 and $1; Harry Corl, $2.25 and $1.50; Edward Doolin, $1.20 and 80 cts.; Richard Stanton, $1.78 and $1.10; Joseph George, $1.16 and $1.10.

Atlantic City, N. J.—Bids for paving a

number of cross avenues in the built-up portion of the city were received Jan. 16, the lowest being submitted by Turner & Moore as follows: Macadam paving, 72 cts. a sq. yd.; vitrified block paving, including foundation, $2.20 a sq. yd.; concrete not covered by block, $5; straight curbing, 40 cts. a lin. ft.; turned curbing, $1.25; straight curbing, reset, 10 cts.; total, $33,290.80. The total of other bids received were: Thos. J. McGovern, $34,838.85; Jas. B. Reilly & Co., $35,747.30; Delaware River, Quarry & Construction company, $34,544.09; Dennis Roe, $35,108.10; Alcatraz Paving company, $35,442.35. The contract was awarded to Turner & Moore.

Louisville, Ky.—The lowest bids received for asphalt paving were as follows: Barber Asphalt Paving company, on East Broadway, from Highland to Transit, $4,795; from Transit to Slaughter, $5,971; from Slaughter to Longest, $11,045; from Longest to Finzer, $4,133; Chestnut-st., from 31st to 34th-sts., $12,500; from 34th-st. to Shawnee Park, $45,534. Alcatraz company, Hepburn-ave., from Barrett to Edward, $5,069; from Edward to Rubel, $5,679; from Rubel to Von Borries, $5,290; Von Borries-ave., from Baxter to Hepburn, $3,302; from Hepburn extended, $355.

SEWERS.

CONTEMPLATED WORK.

Greensburg, Ind.—A sewerage system is needed in this city.

Spokane, Wash.—The construction of sewers in ward 4 is contemplated.

McComb City, Miss.—A sewerage and drainage system is contemplated.

Sleepy Eye, Minn.—The construction of a pipe sewer is contemplated.

South Omaha, Neb.—The construction of sewers in two streets is proposed.

Cleveland, O.—The construction of sewers in about 80 streets is contemplated.

Logansport, Ind.—Plans are being made for 4 mls. of sewers. Cy. Engr. Osmer.

Medford, Ore.—The construction of a sewer is contemplated. H. L. Gilkey, mayor.

Champaign, Ill.—Plans are being prepared for sewers in Clark and Randolph-sts.

Lakewood, O.—The question of issuing bonds for a sewerage system will be voted on.

Havana, Ill.—The city council has voted to build a sewerage system at a cost of $9500.

Worcester, Mass.—Plans are being made for the Millbrook sewer by F. A. McClure, cy. engr.

Baltimore, Md.—An appropriation of $2,000 for a sewer in Burgundy alley has been made.

Galion, O.—The city council is considering the question of constructing a sewer on E. Main-st.

Rantoul, Ill.—The construction of a sewerage system is contemplated.

Norwood, O.—The engineer has been directed to prepare plans for sewers in certain streets.

Winchester, Va.—The question of building a sewerage system is being considered by the council.

Watertown, N. Y.—The city engineer was directed Jan. 20 to prepare specifications for a trunk sewer.

Hamilton, Canada.—Chairman Griffiths of the sewer committee has asked for $31,000 for his department.

Worcester, Mass.—A petition will be sent to the legislature for a trunk sewer from this city to the Atlantic seacoast.

Foxboro, Mass.—A bill has passed the legislature authorizing this town to construct a sewerage system.

Stockbridge, Mass.—Surveys for a sewerage system have been made. Selectman Aymar may be addressed.

Boston, Mass.—The board of estimate and apportionment has passed a loan order of $1,000,000 for sewers.

Cleveland, O.—A resolution has been passed declaring the necessity for a sewerage and drainage system in Drake-ave.

Mattoon, Ill.—The city council proposes to establish a sanitary sewerage system at a cost of about $60,000.

Schenectady, N. Y.—This city has asked for authority to issue $155,000 bonds for constructing a sewerage system.

Tunkhannock, Pa.—The question of issuing $6,500 bonds to complete the sewerage system will be voted on in February.

Anamosa, Ia.—Plans for a sewerage system for this town will be prepared by M. Tschirgi, jr., C. E. of Dubuque, Ia.

Bay City, Mich.—The question of building a sewer in Sixteenth-st. is being considered. Alderman Slaginski interested.

Lawrence, Mass.—The aldermen voted Jan. 9 to engage an expert to supervise the construction of the Shanty Pond sewer.

New Orleans, La.—The question of a $9,000,000 loan for sewerage, drainage and a water supply will be voted on in February.

Fulton, N. Y.—Bids will be asked early in February for building 1,500 ft. of 18-15-in. pipe sewers. O. C. Breed, cy. engr.

Jackson, Miss.—The question of issuing $100,000 bonds for building a sewerage system. D. P. Porter, jr., cy. clk.

Guthrie, Okla.—Immediate action will be taken by the council for the construction of a sewerage system. Councilman Saunders.

Albany, N. Y.—Street Commissioner Wolverton has recommended that old sewers in a number of streets be replaced with new ones.

White Plains, N. Y.—Bids will be asked soon for constructing an addition to the sewage disposal beds, according to press reports.

Dalles, Ore.—A committee has been appointed to report necessary steps for improving the sewerage system, according to press reports.

Dayton, O.—Plans have been ordered prepared for a sewer in district No. 9. An appropriation of $30,000 has been made for the purpose.

Rochester, N. Y.—An ordinance has been passed providing for the construction of a sewer in East-ave., at an estimated cost of $35,000.

Cincinnati, O.—The board of city affairs has been petitioned to build a trunk sewer in Kellogg-ave., from Carroll-ave. to the Crawfish sewer.

Kearney, N. J.—An ordinance has been passed to construct lateral sewers in the southwesterly section of the township. Jas. F. Kelly, twp. clk.

Hamilton, O.—The question of diverting Crawford's run by the construction of a storm sewer, from the canal to the river, is being agitated again.

Grass Valley, Cal.—The new board of city trustees will take immediate action on building a sewerage system. Estimated cost, $40,000. W. E. Parsons, mayor.

San Francisco, Cal.—Resolutions have been passed to construct a 16-in. pipe sewer in Waller-st. and a 2-ft.6-in.x3-ft.9-in. brick sewer in Eighth-ave.

Lead, S. D.—The council contemplates beginning work on the proposed sewerage system, for which plans were prepared by Andrew Rosewater, C. E., Omaha, Neb.

Holland, Mich.—The question of establishing a sewerage system is before the board of public works again. The proposition was defeated two years ago.

Everett, Mass.—This city has petitioned the legislature for permission to issue $100,000 bonds outside of the debt limit for the extension of the sewerage system. C. Harrison, engr.

Cumberland, Md.—The construction of sewers in South Cumberland, at a cost of $6,000 is contemplated. City Engineer Shriver and Councilmen Zimmerman and George are interested.

East Orange, N. J.—An ordinance has been passed by the township committee authorizing the construction of a storm water sewer along the boulevard which the park commission proposes to build.

Oakland, Cal.—The ordinance authorizing the construction of an outlet, at present emptying into Lake Merritt, at a cost of $8,500, and a sewer in Castro-st., at a cost of $1,000, has been signed by Mayor Thomas.

Woonsocket, R. I.—The aldermen contemplate building section No. 4 of the main sewer this season by contract. It will have 700 ft. of 30-in. brick sewer, 280 ft. of syphon under the river and 1,000 ft. of pipe.

Brooklyn, N. Y.—The construction of the Huron-st. sewer, at a cost of $175,000, has been recommended to the board of public improvement by the local board of the 7th district. The board of public improvements has completed plans for a drainage system and sanitary sewers for South Brooklyn, Bensonhurst, Coney Island, Flatlands, New Utrecht, Gravesend and other outlying districts; estimated cost, $13,000,000. The municipal board of Queens borough will be petitioned to build a sewerage system in the Ridgewood and Wykoff Heights districts. M. J. Goldner, deputy comr. sewers.

CONTRACTS TO BE LET.

Atlanta, Ga.— Bids will be received until Feb. 6 for furnishing sewer pipe. D. G. Wylie, comr. pub. wks.

East Grand Forks, Minn.—Bids will be received until Feb. 7 for building a sewer. Henry Harm, cy. rec.

Steelton, Pa.—Bids are asked until Feb. 8 for furnishing 13-mis. of sewer pipe. J. D. Young, boro. secy.

Rickel, Ill.—Bids will be received until Feb. 4 for constructing lateral ditches or tributaries to connect with the main line and tributaries of the Union Special Drainage Dist. Wm. Papendick.

Norristown, Pa.—Bids will be received until Feb. 3 for building an 8-in. clay pipe sewer in Chestnut-st. M. D. Patterson, boro. engr.

Spartanburg, S. C.—Bids will be received until Feb. 3 for building pipe sewers and for furnishing sewer pipe. Arch B. Calvert, mayor.

Stockton, N. J.—Bids will be received until Feb. 9 for building 36x54 in. to 20x30 in. brick sewers in several streets. Wm. S. Abbott, town clk.

Ottawa, Canada.—Bids are asked until Feb. 6 for building 10,912 ft. of circular brick sewers and 1322 ft. egg-shaped sewers. John Galt, cy. engr.

CONTRACTS AWARDED.

Allegheny ,Pa.—The contract for building a sewer in Franklin road was awarded to Ott Bros., for $3,386.

Kingston, Pa.—D. M. Rosser, city, was awarded the contract, Jan. 2, for building a sewerage sytem, for $10,168.

Pittsburg, Pa.—The contract for building sewers, paving, etc., in the Homewood Driving park was awarded to Booth & Flinn.

Newburgh, N Y.—The contract for building the First-st. main sewer was awarded to M. J. Dwyer and Wm. Sager, for $25,826.

Aiken, S. C.—The contract for building the pipe sewers and filtration beds has been awarded to C. A. Robbe, Augusta, Ga., for $20,917.

Rochester, N. Y.—Sewer contracts were awarded Jan. 10, as follows: N. Jay-st., Brayer &Albaugh, $5,901.05; N. St. Paul-st., H. N. Cowles, $3,903.

South Bend, Ind.—The contract for building a sewer on Studebaker-st., has been awarded to Nelson & Webster, and on W. Division-st., to C. H. Defrees.

East Cleveland, O.—Bids were received Jan. 14, for building a section of the sewerage system as follows: F. P. Beers, Cleveland, $10,524.47; R. H. Gray, $10, 531.47.

Scranton, Pa.—Bids were received Jan 5, for constructing a lateral sewer in Van Storch-ave., and Honesdale-st., from six contracting firms, but the contract has not been awarded.

Buffalo, N. Y.—Bids were received Jan. 13, for 12,420 ft. of 10-in. pipe to 5-ft. 4-in. brick sewers and 46 manholes, as follows: Geo. Moore, $32,494; L. Ritzman, $29,363; Ritzman & Miller, $28,607; J. & T. Dark, $28,350; I. Munn, $27,000; C. Smith, $28,900; Brown & Stobell, $29,878; John Harren, $26,450; Wm. Franklin, jr., $29,900; P. McNaughton, $30,000; A. Beaver, $26,700; W. G. Smith, $40,500.

Denver, Colo.—Bids were received Jan. 16, for constructing the Capitol Hill storm sewer, as follows: Jas. J. Fleetford, Denver, $244,159.62; J. M. O'Rourke Construction Co., Denver, $309, 735.19; Queen City Construction Co., Denver, $322,806.93; W. C. Bradbury & Co., Denver, $329,412.95; Benn Brewer & F. C. Schrader, Denver, $334,410.83; Tully & Stenger, Detroit and Omaha, $347,499.60; Ross Frazer & Co., Denver, $349, 367.05; R. P. McDonald Building Co., Denver, $353,12[illegible]; Denver Paving Co., Denver, $357,302.60; Wickham Bros., Council Bluffs, Ia., $364,993.09; Kratz & Crandall, Omaha, $374,171.81. The average bid of ten of the contractors was $344,287.77, while the bid of Fleetford was $244,159.62, more than $100,000 below the average of the other bids, and nearly $150,000 below the engineer's estimate, which was $380,664. The contract has not yet been awarded.

WATER-WORKS.

Meadville, Pa.—This city has purchased the Meadville water plant for $200,000.

Albany, N. Y.—A bill is in the legislature making holders of real estate responsible for water rates of tenants.

Irvington, N. J.—The town council decided Jan. 11 to purchase the plant of the Irvington Water company for the price offered some time ago, $50,000.

North Adams, Mass.—The council decided Jan. 11 to appropriate $4,500 to buy land on the Broad Brook watershed to prevent contamination to the city's water supply.

Chattanooga, Tenn.—A bill will be presented to the legislature asking for authority, on a majority vote, to issue $650,000 bonds for either acquiring the present water plant or building a new system.

Camden, N. J.—The water committee of the council formally took possession of the new artesian well water plant at Morris Station Jan. 20. The seizure of the plant was made on the ground that it had failed to produce 20,000,000 gallons of water daily, as was specified in the contract.

Montpelier, Ind.—The water works and electric light plant was sold recently at receiver's sale for $1. Joseph Shoemaker of the Farmers' deposit bank, who held a mortgage of $15,000 on the plant, purchased it. He also represented other persons who held mortgages aggregating $10,000. The plant is valued at $50,000.

Millbury, Mass.—Allen Hazen, Assoc. M. Am. Soc. C. E., has been appointed by the selectmen of this town to determine what progress is being made at the Worcester, Mass., sewage works in regard to the treatment of all sewage before it passes into the Blackstone river, in accordance with a court decree which was issued several years ago.

Chestertown, Md.—The advisory committee appointed to report as to the value of the Chestertown water works as a basis upon which the board of town commissioners might estimate the price to be paid, has completed its duty. The committee consisted of Eben F. Perkins, T. W. Eliason, J. M. Aldridge, K. W. Lambert, J. H. Simpers, E. C. Atkinson, J. S. Bradley and Samuel Vannort.

Rockford, Ill.—The success of the test of the Mead plant exceeded all expectations. The attempt to pump 6,000,000 gallons resulted in a discharge of nearly 7,000,000 gallons. The Mead engine was run at 204 revolutions, and at this speed its action was as smooth and even as could be desired. Its guarantee was for 3,000,000 gallons, but the test proved that it is capable of doing more than double its duty.

Dunnellen, N. J.—Some of the citizens of this town conceived the idea, a few months ago, of having a water company of their own, and draw the supply by gravity from the wells in the Watchung mountains. The Watchung Water company was formed, and received the franchise, to have the system complete in six months. No work was done, however, until recently, and the council rescinded the franchise, and the mayor served notice on the company, Jan. 19, to stop digging and to fill the trenches.

Chicago, Ill.—A map, showing the exact location and indicated size of all the water mains in the city, is now being prepared by City Engineer Ericson. Mr. Ericson claims that the city's pumping station would be immeasurably more effective if the water pipes in the system were of larger diameter than the mains. In some instances 8-ft. mains empty into 8-ft. and 6-ft. mains, the result of which is the loss of power in the outskirts of the city and many places on the west side, where the tributry system is most complex.

Fulton, N. Y.—The commission appointed by the court to appraise the value of the property of the Fulton Water Works company, under the proceedings instituted for acquirement of the property by the village, has made its report. The award of the commission is $172,500 for the entire plant. The proposition to buy the plant of the water company and thereafter have village ownership will be submitted to the electors of the village in a special election. The commission consisted of ex-Judge Charles Andrews and William R. Hill, chief engineer and superintendent of water department, Syracuse, N. Y., and William Wheeler, C. E., Boston, Mass.

CONTEMPLATED WORK.

De Land, Fla.—The extension of the water works is proposed.

Starbuck, Minn.—The need of water works is urged by the press.

St. Johns, Mich.—Water mains extensions are contemplated. C. C. Vaughn, clk. of bd.

Blockton, Ia.—Plans are being prepared for a water works system.

Hammonton, N. J.—A company is being organized to build water works.

Duncansvile, Pa.—The question of water supply is being considered.

Branchville, N. J.—Surveys for the proposed water system have been completed.

Brooklyn, N. Y.—The isue of $250,000 bonds for new mains has been authorized.

Waverly, Ia.—The question of an additional supply is being considered.

Kankakee, Ill.—The water works have been sold and improvements will be made at once.

Phoenixville, Pa.—This borough may be compelled to seek a new source for a water supply.

Saginaw, Mich.—The question of a purer water supply for this city is again being agitated.

Duluth, Minn.—The construction of a middle water system is contemplated by the city authorities.

Detroit, Mich.—Water mains will be put in 70 acres of land which the Park Hill Land. Co. has purchased.

Hartford, Mich.—Bids will probably be asked about the last of February for building the proposed works.

Duluth, Minn.—The question of issuing $150,000 bonds for water mains extensions will be voted on Feb. 7.

West Bay City, Mich.—Plans and estimates for a water works system have been submitted by J. H. Blomshield.

Sacramento, Cal.—A 10,000,000-gal. pump, to replace the old Stevens pump, is recommended by Mayor Land in his annual message.

Woodhull, Ill.—The council desires to grant a franchise for a water works and electric light plant; estimated cost, $10,000.

Massena, N. Y.—The question of building water works is being agitated and the address of engineers is desired. H. B. Chase.

Upton, Mass.—The Upton Head Aqueduct society voted, Jan. 13, to purchase 21 acres of land on Pratt Hill, to be used for a water supply.

Tullylake Park, Pa.—A water plant will be built to supply the hotel, cottages and grounds. F. J. West, vice-prest. Tully Lake Park Assoc.

Superior, Wis.—Plans are being prepared for the new filtration system to be built in the spring. Prest. Merriam, of Wat. Lgt. & Power Co.

Providence, R. I.—Plans for both natural and mechanical filtration have been presented to a committee of the council for consideration.

Millvale, Pa.—The borough clerk has been instructed to advertise for the sale of $5,000 of water works bonds, preparatory to building new water works.

Oswego, N. Y.—Improvements to the city water works will be made in the spring. About 2,500 ft. of pipe, with special castings, will be required.

Long Island City, N. Y.—Plans have been filed by the Montauk Water Co. for the erection of a steel water tower on Borden ave.; estimated cost, $11,500.

Wilmington, Del.—The construction of a new water tower near Mt. Salem Church is contemplated by the water commissioners; estimated cost $10,000.

Schenectady, N Y.—The preparation of a bill authorizing the issue of $30,000 bonds to provide for extending the water and sewer mains has been ordered.

Kansas City, Mo.—The board of public works decided Jan. 13 to lay a 16-in. water main on Seventeenth-st., from Madison to Baltimore-aves., at a cost of $9,200.

Ottumwa, Ia.—The question of submitting to the people March 27 the question of municipal works is being considered. Alderman Hogeland, chrmn. water com.

Williamsport, Md.—Bids will be asked soon for building the water works and electric light plant. Steam pumps, water tower and 6 miles of pipe will be required.

Barnesville, O.—The construction of a municipal water works plant has been recommended and engineers will probably be asked to estimate the cost of the construction.

Brownsville, Tenn.—This town has voted to ask the legislature for permission to issue $38,000 bonds for improving the water works and constructing an electric plant.

Dunkirk, N. Y.—A proposition to furnish this city with a new water supply from Bear Lake, 12 miles distant, have been submitted by Dr. F. P. Vandenberg of Buffalo.

Martinsburg, W. Va.—This city has asked the legislature for authority to issue bonds for a new set of pumps, of 2,500,000 gals. capacity and for 4 miles of water mains.

Frederick City, Md.—The board of aldermen has practically decided to increase the water supply of this city by taking Fishing creek and the work will commence in the spring.

Nashville, Tenn.—The council is considering an ordinance which provides for submitting to the people the queston of ssuing $150,000 bonds for the extension of the water plant.

Frankfort, Ind.—The town council has voted for a water works system and a committee, consisting of Ed Frank, Elmer Innis, J. D. Hurst and Perry Jones will inspect water systems in other places.

Evanston, Ill.—The construction of a new intake pipe at a probable cost of $100,000 is recommended by Mayor Dyche. He recommends the purchase of a battery of boilers at a cost of $4,500.

The question of issuing bonds for water works will be voted on as follows: Duncansville, Pa., Feb. 23; Springboro, Pa.; Cuyahoga Falls, O., Feb. 18; Kettle Falls, Wash., Feb. 7; Branchville, N. J.

Fishkill, N. Y.—A report for a new water supply has been submitted, which provides for the purchase of the works of the Fishkill & Matteawan Water company, or the building of new works. F. F. Startup, clk.

Oregon City, Ore.—New water works are proposed, the supply to be received from the Clackamers river. Chas. H. Caulfield, H. C. Stevens, T. F. Charman, water comrs.; C. D. Latourette, mayor.

Berea, O.—The village council passed an ordinance, Jan. 11, empowering Mayor Quayle to appoint a board of water works commissioners in the near future, after which the construction of a water works system will be rapidly pushed.

Fayetteville, Tenn.—Plans for a water works system are being prepared by Walter G. Kirkpatrick, C. E., Jackson, Miss. The supply is to be from Mountain Springs, with gravity flow to masonry distributing reservoir. Cast iron mains will be used.

Fairfield, Me.—This town has voted to join Waterville, Benton and Winslow in a petition to the legislature for the passage of a bill authorizing the formation of the Kennebec Water District. V. R. Connor, E. Kelley and H. F. Burgett, interested.

Traverse City, Mich.—The committee appointed to investigate and report on the question of purchasing or building water works has not yet reported, but bids will probably be asked next summer for a plant to cost about $100,000. H. F. Northrup, cy. engr.

Winchester, Ind.—The letting of contracts for water works and electric light plant has been postponed, and D. W. Mead, Rockford, Ill., has been employed as consulting engineer to prepare plans and specifications. Bids will be invited again. S. D. Fox, cy. clk.

The construction of water works is contemplated at the following places: Republic, Wash.; Orchard Park, N. Y.; Barrett, Minn.; Red Lake Falls, Minn.; Heber, Utah; Alexandria, S. D.; Waveland, Ind.; Glouster, O.; Evergreen, Ala.; Mayville, N. D.; Swedesboro, N. J.; Clayton, Mo.; Ft. Pierre, S. D.; Pratt City, Ala.; Junction, Ark.; Wildomar, Cal.; Prescott, Ariz.

Philadelphia, Pa.—In accordance with the request of councils, Thos. M. Thompson, director of public works, has prepared an ordinance providing for six water filtration plants with a combined daily capacity of 42,000,000 gallons. The estimated cost of the plants, including pumps, sedimentation basins and land, is $9,325,000. Slow sand filtration will be used for the most of the proposed capacity, with mechanical filtration at stations where no land is available for filter beds. Director Thompson has also

been authorized to prepare and secure proposals for a 150,000,000-gallon pumping station, sedimentation basins and filter beds on the Delaware river.

CONTRACTS TO BE LET.

Spring Lake, N. J.—Bids are asked until Feb. 13 for building water works. H. C. Van Arsdale, clk.

Visalia, Cal.—Bids are asked until Feb. 9 for laying water and gas mains on certain streets. T. W. Twaddle, chrmn. bd. supervisors.

Elkhart Lake, Wis.—Bids will be received until Feb. 20 or building a water works system and elevated tracks. G. A. Kraemer, vil. clk.

Oto, Ia.—Bids are asked until March 1 for building the water works system, consisting of 25,000 gal. reservoirs, double-acting pumps, gasoline engine, etc. P. G. Riedesel, mayor.

Honolulu, Hawaiian Is.—Bids are asked until Feb. 21 for a triple compressed condensing crank and fly wheel pumping engine of 200,000 gals. per hour capacity. Hawaiian Consulate Gen'l., 63 and 65 Wall-st., New York City.

St. Louis, Mo.—Bids are asked until Feb. 7 for furnishing 4,100 tons of 6, 12, 20, 30-in. cast iron water pipe, special castings, etc., and for laying about 35,600 feet of water pipe, taking up 9,000 feet water pipe, etc. Robert E. McMath, prest. B. P. I.

CONTRACTS AWARDED.

Millvale, Pa.—H. R. Worthington, New York City, was awarded the contract for a 2,000,000 gal. pump, for $4,845.

Pittsburg, Pa.—The contract for laying the new 40-in. water main has been awarded to the T. A. Gillespie Co., for $79,940.

Clarksburg, W. Va.—The contract for improving the water works has been awarded to W. B. Osborn, city. Contracts for material have been let as follows: Pipe, Addyston Pipe & Steel Co., Cincinnati; hydrants, Ludlow Valve Mfg. Co., Troy, N. Y.; pump, Snow Steam Pump Works, Buffalo; boilers, Erie City Iron Works, Erie, Pa.

BRIDGES.

Albany, Mo.—The erection of a bridge across Grand river, at Greenwell ford, is proposed.

Rockford, Tenn.—The construction of a steel bridge over Little river is contemplated.

Carrollton, Ky.—A company is being organized to build a bridge across the Kentucky river.

Reading, Pa.—Plans for a bridge at Spring-st. have been prepared by the city engineer.

Saginaw, Mich.—The city engineer has been ordered to prepare plans for a bridge at Genesee-ave.

Hamilton, O.—The county commissioners have been petitioned to construct a bridge across Elk creek.

Reading, O.—The freeholders will petition the county commissioners to build a bridge over Mile creek on Clark-st.

Hillsboro, Mo.—Bids will be received until Feb. 6 for building a steel bridge near Trumet, Mo. Co. comrs.

Shreveport, La.—Bids are asked until March 2 for a bridge in ward 1 over Cow Hide bayou. P. Youdrees, prest. jury.

Loogootee, Ind.—The building of an iron bridge across the Lost river at the Purkhiser ford has been petitioned for.

Somerville, Mass.—The county commissioners have ordered a steel bridge built over the Fitchburg railroad on Beacon-st.

Lockport, N. Y.—The state board of public works will build a lift bridge on the canal at Exchange-st. in the spring.

Iowa City, Ia.—The board of supervisors have been petitioned to build a bridge across the Iowa river at Holland's ferry.

Nebraska City, Neb.—Bids are asked until Feb. 9 for constructing all bridges during the year ending March 1, 1900. H. R. Christy, co. clk.

Dimondale, Mich.—The contract for a steel bridge, 150-ft. long, was awarded to the Wrought Iron Bridge Co., Canton, O., for $2,590.

Helena, Ark.—Bids will be received until Feb. 15, for constructing three steel bridges. N. J. Fritzon, chrmn. bd. pub. affairs.

York, Neb.—Bids will be received until Feb.11, for all bridges to be built in the county during the remainder of the year. J. D. White, co. clk.

Kansas City, Mo.—The board of public works has approved plans for the construction of a steel bridge over the Belt Line ry. at Kansas-ave.; cost, $4,000.

Fertile, Minn.—County Commissioners McCarthy and Eastman, of Crookston, will order a new bridge built over the Sand Hill river, near this town.

Kankakee, Ill.—The city engineer has submitted plans for a steel and cement bridge, which it is proposed to build at Washington-ave. at a cost of $4,000.

Newark, N. J.—The bridges over the Passaic river at Bridge-st., Clay-st. and Fourth-st., will be reconstructed. S. B. Beidelman, chrmn. Joint Br. com.

Greece, N. Y.—The board of county supervisors, Rochester, will secure plans for building a new bridge over the Genesee river, between Greece and Irondequoit.

New York City.—Bids will be received until Feb. 2, for reconstructing the Blissville bridge crossing Newtown Creek, at Greenpoint-ave. John L. Silna comr.

Bloomington, Neb.—Bids will be received until Feb.21, for building all wood and steel bridges in Franklin county during the remainder of the year. F. N. Harris, co. clk.

Wahoo, Neb.—Bids, accompanied by plans, will be received until Feb. 3, for the erection of all bridges in Saunders county during the year 1899. L. Martenson, chrmn.

McMinnville, Tenn.—The erection of two bridges over Collins river has been authorized by the county court. J. C. Biles, Frank Rust, Frank Hill, Br. com.

Ord, Neb.—Bids, accompanied by plans and specifications, will be received until Feb. 9, for building a bridge across the Middle Loup river near Arcadia. Vincent Kokes, co. clk.

Syracuse, N. Y.—The bill authorizing this city to levy a tax to the amount of $6,000 for building a steel girder bridge over Onondago creek has been favorably reported.

Cleveland, O.—Bids will be received until Feb. 4 for reconstructing the steel and iron superstructure of the Center-st. bridge on

Cuyahoga river. Geo. R. Warden, dir. pub. wks.

David City, Neb.—Bids, accompanied by plans and specifications, will be received until Feb. 6 for building all pile and iron bridges during the year 1899. John J. Graham, co. clk.

Chicago, Ill.—Bids are asked until March 15 for one railroad bridge and two highway bridges across Desplaines river in Joliet. Jos. F. Haas, clk. sanitary dist. of Chicago.

Quebec, Canada—Bids will be received until March 1, postponement, for the construction of a combined railway and highway bridge across the river St. Lawrence. Ulric Barthe, secy. Quebec Br. Co.

PARKS.

Saginaw, Mich.—Mayor Baum has recommended the improvement of the land adjacent to the Court-st. bridge, on the south side of the river, for park purposes.

Utica, N. Y.—An expenditure of $110,000 for purchasing land for a system of parks, and $50,000 for improving it, is proposed. Russell H. Wicks, chrmn. imp. com.

Westport, Mo.—A committee was appointed Jan. 21 to outline plans for a park and boulevard, to be submitted at the next meeting of the Westport Improvement Association, which meets the first Thursday in February.

Newark, N. J.—Charles MacAndrews has donated four acres of land, contiguous to the Branch Brook park, to the Essex Park Commission. The Twelfth Ward Improvement Association has petitioned for a public park on the river front, between Ferguson and Frederick-sts.

Chicago, Ill.—The expenditures outlined by the West Park commissioners for the parks this year are as follows: Southwest park, $84,000; Douglas park, $51,000; Douglas boulevard, $17,000; Garfield park, $13,000; Central park boulevard, $5,000; Humboldt park, $31,000; Jefferson park, $2,500.

Philadelphia, Pa.—Chief Engineer Vogdes of the park commission has recommended the expenditure of $30,000 to complete the widening of East Park drive; macadamizing Lincoln-ave. drive, from Wissahickon-ave. to Walnut lane, $16,000; brick cycle paths on Chamounix drive, $10,000; continuing Thirty-fourth-st. drive to Callowhill-st. bridge, $25,000; laying new sidewalks, $10,000.

Indianapolis, Ind.—A bill creating a park board for Indianapolis, which will be submitted to the legislature, provides for a new board of six members, two of whom are to be women, and not more than three members are to be of the same political party. The appointments are to be made by the mayor, and the members are to serve four years without compensation. No assessments or benefits shall be made, and the cost of all park lands is to be paid out of the general treasury.

STREET LIGHTING.

Johnstown, N. Y.—Bids are asked until Feb. 7 for lighting this city with electricity.

Alexandria, S. D.—The question of building an electric light plant is being considered.

Woodsfield, O.—Bids are asked until Feb. 7 for building an electric light plant. Geo. P. Dorr, clk.

Evansville, Ind.—The council has voted, according to press reports, to build a municipal lighting plant.

York, Pa.—Bids are asked until Feb. 10 for lighting this city with electricity for one year. Jos. Parkhurst, chrmn. com.

Wellesley, Mass.—A committee has been appointed to ask the legislature for authority to build a municipal lighting plant.

Trenton, N. J.—Bids will be received until Feb. 7 for lighting the streets with gas, gasoline or naptha. E. Edw. Murray, cy. clk.

Thibodeaux, La.—Bids will be received until Feb. 9 for building a municipal lighting plant. E. N. Roth, chrmn. lgt. com.

Spartanburg, S. C.—Bids are asked until March 1 for furnishing 100 or more 2,000 c. p. arc lights for a period of 5 or 10 yrs. A. B. Calvert, mayor.

Winchester, Ind.—The letting of the contract for a water works and electric light plant was postponed, and D. W. Mead, C. E. Rockford, Ill., has been engaged to prepare plans. S. D. Fox, cy. clk.

The consolidation of the illuminating and natural gas and electric lighting properties, plants and franchises in Central and Southern Indiana and Ohio has about been completed. The principal factor in the combination is said to be R. E. Benedict, who has large investments in gas property throughout Indiana. Associated with him are Anthony N. Brady, Frederick P. Olcott, Samuel Thomas, Chas. F. Diedrich, John Sloan and Samuel Thorne.

GARBAGE DISPOSAL AND STREET CLEANING.

Woonsocket, R. I.—The question of garbage collection has been postponed.

Cairo, Ill.—The question of new methods of garbage disposal is being considered by the council.

Erie, Pa.—An ordinance has been introduced for the construction of a garbage disposal plant.

Atlantic City, N. J.—The contract for the removal of garbage has been awarded to Mark Townsend for $8,900.

Detroit, Mich.—The consideration of the city building its own garbage disposal plant is urged by the mayor.

New York City.—The board of estimates has authorized the issue of $569,399 bonds for the street cleaning department.

Oakland, Cal.—The council has refused to grant a 50-yr. franchise to J. W. Northrup for operating a garbage disposal plant.

Norfolk, Va.—Bids for the removal of garbage, etc., for one year from Feb. 1 have been advertised for by the local board of improvements.

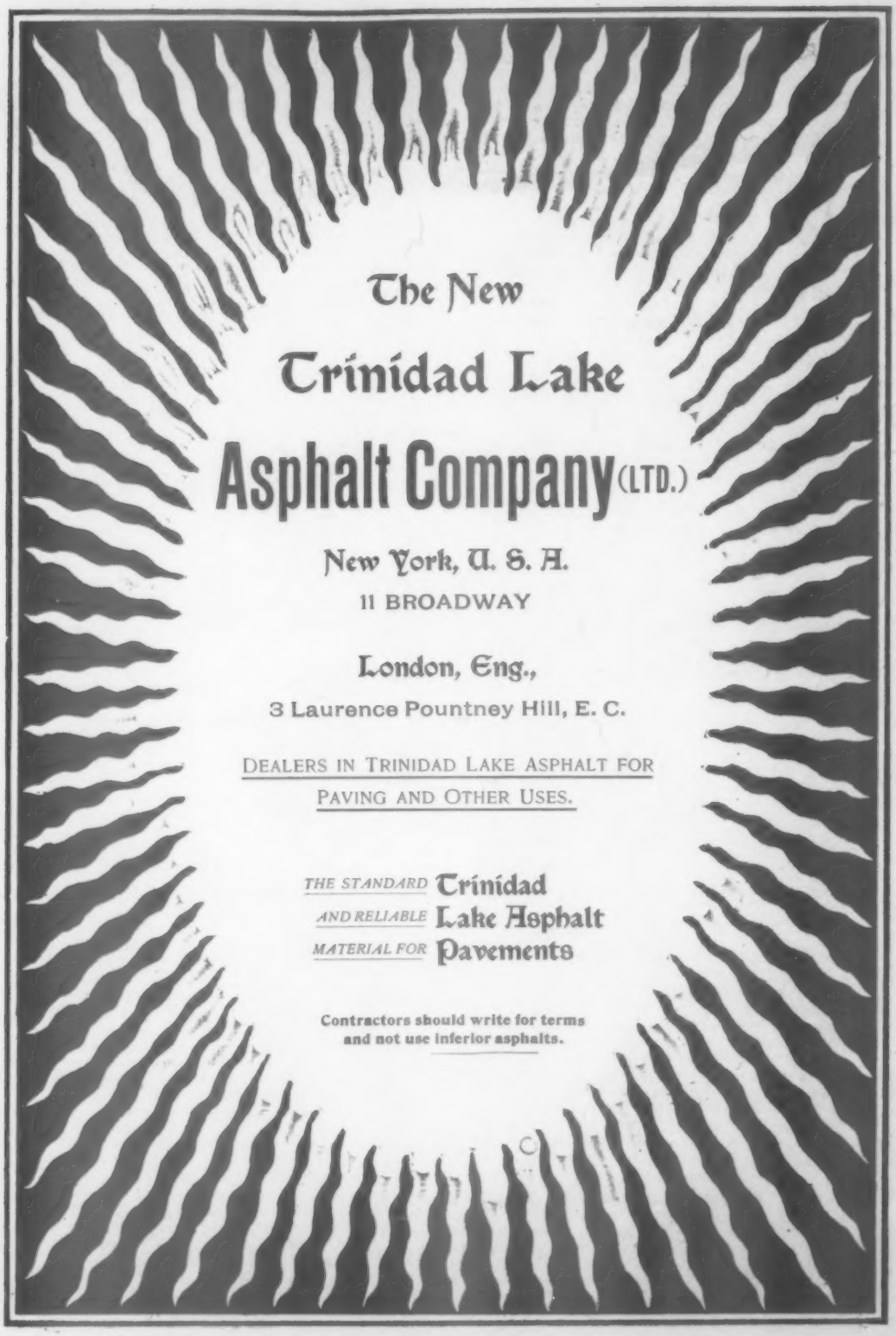
Chicago, Ill.—The lowest bidder Jan. 24 for a garbage plant was the Thackeray Incineration and Fertilizing company of San Francisco, Cal.

East Liverpool, O.—The board of health is considering a proposition to build a garbage disposal plant. J. Cross Kerr, chrm.

South Bend, Ind.—The mayor has directed the board of public improvements to report upon a garbage disposal system for this city.

London, England.—Plans are wanted by

(Continued on page 30.)



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